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ABSTRACT

This document presents papers delivered at a symposium held to discuss the problems associated with excessive specialization in contemporary education and of ways of counterbalancing this trend. Papers were presented in the areas of mathematics, fine arts, science, literature, philosophy, psychology, social sciences, and integrative education. (SL)

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Proceedings of a series of symposia co-sponsored
by the Canadian Centre for Integrative Education
and the Faculty of Education, Queen's University

# AN IMAGE OF THE WHOLE:
## KNOWLEDGE AND CURRICULUM IN AN AGE OF FRAGMENTATION

Edited by William Higginson

Faculty of Education
McArthur Hall, Queen's University
Kingston, Canada, K7L 3N6

February 1978

*When it is a question of determining the origin, contents and limits of a particular faculty of the human mind, the nature of human knowledge makes it impossible to do otherwise than begin with an exact and (as far as is allowed by the knowledge we have already gained) complete delineation of its parts. But still another thing must be attended to which is of a more philosophical and architectonic character. It is to grasp correctly the idea of the whole, and as united in a pure rational faculty. This examination and the attainment of such a view are obtainable only through a most intimate acquaintance with the system.*

- Kant, Preface to Critique of Practical Reason

*We recognize the social, personal and theoretical importance of an image of the whole which can meaningfully unite our contemporary knowledge of the physical universe and the world of organic life, with the expressive modes of human knowing present in literature, art and music. To this end we seek the development of perspectives in mathematics, the natural sciences, social sciences, arts and humanities which will contribute to a sustaining vision of the place of man and mind in the universe.*

Main Currents in Modern Thought. Journal of the Center for Integrative Education (1940-1975), 1974, 30 (3), 114.

Symposium 1. A drinking party; a convivial meeting for drinking, conversation, and intellectual entertainment; properly among ancient Greeks, hence generally.

*I take it for granted that ... your symposium is intended more to promote conversation than drinking.*
Chesterfield, Letters to His Son (1774).

2. transf. A meeting or conference for discussion of some subject; hence, a collection of opinions delivered, or a series of articles contributed, by a number of persons on some special topic.

*Symposia; or, Table Talk in the month of September, 1784, being a rhapsodical hodge-podge.*

Title, (1784).

O.E.D.

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# Preface

The constituent parts of this publication are papers delivered at a symposium series held at Queen's University during the 1977 Winter Term. The title of the series, which was co-sponsored by the Canadian Centre for Integrative Education and the Faculty of Education, Queen's University, was "An Image of the Whole: Knowledge and Curriculum in an Age of Fragmentation." The problem which served as a theme for the sessions was the issue of excessive specialization in contemporary education and the need for ways of counterbalancing this trend. Jean Piaget has written of his concerns in this area in his book To Understand is To Invent:

> I should like to stress once again a major question that concerns the secondary and university levels in particular: it is that of the more and more interdisciplinary nature of research in every field. At present, future researchers are ill-prepared in this respect, owing to instruction which aims at specialization but which ends in compartmentalization-- the reason being a failure to understand that all thorough specialization necessarily involves relationships between many fields.... What is needed at both the university and secondary levels are teachers who indeed know their subject but who approach it from a constantly interdisciplinary point of view-- i.e., knowing how to give general significance to the structures they use and to reintegrate them into over-all systems embracing the other disciplines. In other words, instructors should be sufficiently penetrated with the spirit of epistemology to be able to make their students constantly aware of the relations between their special programme and the sciences as a whole. Such men are rare today.
> (1973, pp. 29-30)

In an attempt to provide a forum for a discussion of this question and its educational implications, sixteen speakers were invited to give short surveys of the "Nature, Role and Future" of their discipline. In each of eight two-hour sessions two such presentations were followed by a discussion period. The disciplines represented and the speakers participating were, in the order of presentation:

Mathematics: Dr. John Coleman, Dr. William Higginson
Fine Arts: Professor David Keane, Professor Janet Russell
Science: Dean Duncan Sinclair, Professor John Olson
Literature: Dr. Stephen Bonnycastle, Professor Ron Turner
Philosophy: Dr. Millard Schumaker, Dr. George Hills
Psychology: Dr. Peter Dodwell, Dr. Harry Osser
Social Science: Professor Binky Tan, Professor Iain Munro
Integrative Education: Dr. Rob Walker, Dr. Hugh Munby.

The chairman of such an enterprise incurs a large number of debts and it is fitting that these debts be noted, if not repaid. This project would not have been possible without the cooperation and support of a number of people. Among this number I am particularly grateful to:

the session speakers, chosen after wide consultation with members of the university community for their acknowledged excellence in their discipline, who gave generously of their ideas and enthusiasm (of which they had a great deal) and their time (of which they had very little);

the commentators: Dr. Hugh Allen, Dr. Martin Schiralli, Dr. Hugh Munby, Mr. Peter Wilson, Mr. Duncan Taylor, Dr. Ray Peters, Professor Bill Elkin, and Dr. Douglas Crawford, who ably integrated the two major presentations in each of the sessions;

Patricia Whitaker, who by bringing her keen intelligence to bear on this project in the combined role of typist and editor's editor, has considerably improved the final publication;

Dean Bill Peruniak, Dean Vernon Ready, and Dean Tom Williams of the Faculty of Education for their constructive criticism and financial support of this project;

Dr. A.M. Taylor and members of the Canadian Centre for Integrative Education for their suggestions and support;

two of the speakers for their versatility: Dr. Hugh Munby who commented on one session and chaired four others, and Dr. Millard Schumaker who designed the cover of this publication; and

the members of the Queen's community who attended these sessions and made the discussion periods so lively and enjoyable.

W. Higginson
February 1978.

# *WHAT IS MATHEMATICS?*
# *IS IT ACTUALLY DIFFICULT?*

A.J. Coleman

Whenever I think about the nature or significance of mathematics, I am normally driven back to the writings of my mentor, Alfred North Whitehead--in particular, to The Aims of Education and the second chapter of Science and the Modern World. You will recall that he begins the latter by comparing music and mathematics as claimants for the title of the greatest creation of the human spirit . . . he opts for mathematics. In contrast to the outmoded definition of mathematics which still can be found in some dictionaries--"mathematics is the science of number and position" (i.e. it is exhausted by arithmetic and geometry), Whitehead views mathematics as the study of all potential forms of order or structure.

Mathematics is not concerned with actual order and therefore, unlike physics, chemistry or biology, tells us nothing about the real world. Mathematics can assure us that "If Mary has TWO oranges and Bill has TWO (and they do not eat them before this sentence is finished) THEN, together they have FOUR oranges." But mathematics gives us no assurances of the precise number of oranges (if any!) that either Bill or Mary in fact have. Contrast this with physics which assures us that an atomic weight of Beryllium contains 6.023 x $10^{23}$ atoms.

Mathematics is the most abstract of the sciences. It deals only in ideal concepts, in figments of the imagination like point, the number 2, the Butterfly Catastrophe, the Special Unitary Group on Seven Variables. Who has ever seen, touched, smelled, or heard the number 2? Perhaps you have seen the numerals II, 2, dva, two, deux. You have never seen the number. It is abstract . . . an airy nothing.

Yet these "nothings" have obsessed many great intellects. The Soviet Union, whose government generally seems to adopt a hard-nosed practical approach to human affairs, finances more than fifteen Institutes devoted to the study of mathematics. The Steklov Institutes in Moscow and Leningrad have 120 members each, whose sole duty is research in mathematics; the Mechanics-Mathematics Faculty of Moscow University, with about 2000 students specializing in mathematics, has approximately 220 faculty members.

Mathematics is BOTH the most abstract, fascinating and compelling of the arts AND the most useful and practical of the sciences. This paradox is now fully established as Whitehead saw already in 1925. It is written patently in the activities of mathematicians and in the policy of governments (perhaps not all that obviously in the policy of Canadian governments!). It has been estimated that the amount of known pure mathematics doubles every sixteen years. However, more striking and significant for the form of our civilization, is the fact that mathematics has been penetrating engineering and the other sciences at an even faster rate during this century. In the past twenty years it has even invaded economics, psychology, and biology.

But if mathematics is so fascinating, so useful, and so wide-spread in its application, why is it feared? Perhaps one of the most significant conclusions of the recent report Mathematical Sciences in Canada is that many Canadians--probably a large majority--regard mathematics as an esoteric subject for specialists which they can never hope to master or even understand dimly. In programmes for training elementary teachers, when there is an option, most prospective teachers avoid mathematics because, in the past, they have had unhappy experiences with it. They are sure that they will fail a course in mathematics or, at least, end up with a feeling of inadequacy. This widespread anxiety feeling among elementary school teachers is transferred, inevitably, to the whole population.

Is mathematics all that difficult? If not, why does it seem so to many Canadians? What can be done?

It can be argued, as in Mathematical Sciences in Canada (Beltzner, 1976, p. 118), that the natural operations of the human mind are algebraic in character. That is, we are all born potential algebraists! The main evidence for this is the universal ability of children to make use of the structure and, as is well-known, the distinguished French author Bourbaki, has classified contemporary mathematics under the categories of ORDER, ALGEBRAIC, and TOPOLOGICAL structures. Indeed, Piaget, in one of his latest works, described a parallelism between the operations of the human intellect and these three primordial structures of Bourbaki. Thus, innately, all men are mathematicians.

This mathematical capacity is probably most highly developed in man's cerebral cortex. Neuro-physiologists have mapped different regions of the brain according to their chemical-histological characteristics and their psychological function. One classification, related to the evolution of the brain, distinguishes among the reptilian, the limbic, and the post-mammalian "brains". These correspond roughly to (a) metabolism and motion; (b) our emotions--sex, fear, anger; (c) ratiocination, logic, and aesthetic appreciation. It is interesting that the brains of whales are several times larger than man's. One theory argues that this is needed in order to enable the whale to perform the huge calculations involved in the use of sonar to explore its environment for many miles.

As even a superficial knowledge of the history of mankind, or minimal insight into our own behaviour, reveals man is governed chiefly by feeling, instinct, and lust. Reason, which appears fitfully in history exercising a benign though weak influence, is merely a pale shadow which occasionally moderates human affairs.

I therefore conclude that though man is potentially a mathematician, who like Gauss could discover and prove the Reciprocity Law for Quadratic Residues, his urge to develop and exploit this potential is overshadowed, indeed usually submerged, by his urge to eat, to make love, or to dominate others. So it is a commonplace observation of parents "Though I think that Johnny and Mary are of equal intelligence, Johnny did not like his teacher SO he never learned to add or spell, while Mary adored Mr. Smith and did very well in both."

What are the practical implications of the above analysis for the teaching of mathematics in Canada? There are many but one is of overwhelming importance. The teachers of mathematics from kindergarten through the Ph.D. should have as their prime concern the emotional context in which the teaching of mathematics takes place. Let us adopt as our slogan TO MATHEMATIZE IS TO JOY, attempting to suffuse our whole society with this feeling-tone. Only then will we be able to explore, in a valid way, the innate mathematical capacities of the average Canadian.

As I write these words I am in Leningrad having completed four weeks of the six week visit to the U.S.S.R. during which one of my chief aims has been to understand how mathematics is taught here. Only yesterday I visited

School No. 169 which has 750 students of age 7 to 17 in 20 classes, and about 40 teachers who spend 3 to 4 hours each day in the classroom for 6 days per week. I spoke with the Principal and teachers and observed at the Grades 3, 7, and 10 levels. In recent years the curriculum in several subjects has been changed. The "Kolmogorov" reform of mathematics has been working its way up from Grade 1 and reached Grade 10 one year ago. So I was observing the second year of the new programme at the final year level. The essence of the reform, as of recent reforms in Europe and North America, was to decrease the emphasis on *rote* learning and put more on *ideas*. The curriculum contains essentially everything in the Ontario programme and goes beyond it in several respects: e.g. convergence of series and integration of trigonometrical and exponential functions are discussed at about the Queen's first year level; graphing of functions and the solution of inequalities are carried much further than in Ontario. For example, the Grade 10 class, which I observed, had finished the course a week or so before and is now engaged in a five week review of the year's work. The homework assignment included the problems

(1) Graph the function $x \rightarrow (2x^2 - 3x)e^x$

(2) Solve the inequality $(1 - 0.4x^2)/(5 - x) \geq \frac{3}{5}x$

(3) Solve $\log_4 2x + \log_2 x = 5$

(4) Determine whether $\log(x + \sqrt{1 + x^2})$ is even or odd.

The school specializes in English and its mathematics is not regarded as at all outstanding. Every student in the school takes mathematics (6 hrs./wk. in Grades 1-8; 5 hrs./wk. in Grades 9 and 10). The Soviet Union is in the process of implementing a recent law which requires all children to take the full 10 years of education. This law is now in full effect in the larger cities. I was impressed by the fact that parents seem to play a much larger role in the educational process here than they do in Canada. Too often our Teachers' Federations seem to espouse the view that education is a professional activity in which parents should not interfere and whose practitioners should be paid the same salaries as brain-surgeons. In the U.S.S.R., as in most well-run European School systems, the student has a report card four times a year together with an overall average at the end. There are final examinations only at the end of Grades 8 and 10 when certain options are available for further education. The vast majority in Leningrad remain in the regular school through Grade 10 so most young people in Leningrad, by the age of 17, have completed more mathematics than the Ontario student who takes the full mathematics programme in Grade 13.

Parents are required to come to the school once a month to discuss the progress of their children with teachers. The school runs a Parent's University, normally between 9 a.m. and 5 p.m. on Saturday to which many parents come once a month to keep abreast of the changing curriculum so they can encourage and help their children. Each school has a direct liaison with one or more factories which help it financially and in other ways and which provide opportunities for students to explore the possibilities for their future employment.

When the mathematics curriculum was reformed in Leningrad, the new textbooks (which are uniform for the whole country and cost 35 to 50 cents each) were available to teachers one year before the changes were introduced into the schools. Every teacher of the subject under reformation throughout the 700 schools in the Leningrad district was required to attend and pass special courses at pedagogical institutes in order to be authorized to teach the new programme. There were groans from teachers and parents. Now some university professors complain that there is not sufficient emphasis on rigor and the concept of proof. However, my observations in the mathematically average School No. 169 suggested that the programme is working well. My impressions were confirmed in conversation with three Leningrad mathematicians.

Are people in Leningrad born with greater mathematical ability than Canadians? I doubt it. For me, a sufficient explanation of the difference in the achievement of our schools, is that Soviet society as a whole--the government and the people--have accepted Lenin's high valuation of science and have put amongst their highest priorities the fullest possible development of the intellectual capacities of young people. They pursue this goal in a rational manner. School No. 169 had a lively sense of purpose which I could feel in everyone I met. The students whom I observed in class were free and lively. They were eagerly and joyfully engaged in the important work of learning. Mathematics seems to be an accepted part of their lives.

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# REACH AND GRASP: OBSERVATIONS ON THE POTENTIAL AND REALITY OF MATHEMATICS EDUCATION

William Higginson

> *Ah, but a man's reach should exceed his grasp,*
> *Or what's a heaven for?*
>
> *R. Browning 'Andrea del Sarto'*

Like Caesar's Gaul, this paper is in three parts. The first two deal with the potential and the reality of mathematics in education. In the third section some recommendations are made for narrowing the gap which seems to exist between the potential and the reality.

The first question to be addressed is that of the role of mathematics in any comprehensive programme of education. What arguments can be made for including this discipline in a school or university curriculum? It will not come as a surprise, I think, given my vested interests, if I claim that because of its nature, mathematics should play a central role in any general programme of education.

There are two main arguments with which one might attempt to substantiate this claim. The first, the banausic or utilitarian argument, is orthodox and well-known. Briefly it runs: 'mathematics, like cod liver oil, is good for you; try it; you may not like it but, despite this, rest assured that it is doing good things for you'. In one of its primitive forms, this argument often has a strong hierarchical ring: you must study algebra because without algebra you can't do calculus and without calculus you can't become an engineer; thus algebra (or whatever) must be part of the total curriculum.

A higher order version of the banausic argument goes: our culture is characterized to a great extent by the available range and power of our technology; this technology is a direct product of scientific research and scientific research in turn rests completely on mathematics. Ergo, to understand the culture, one must understand the nature of its scientific foundations and this one can do only if one is mathematically knowledgeable.

A sophisticated version of this argument is given by the gifted contemporary critic of English literature, George Steiner, in his book In Bluebeard's Castle (1971):

> As in the twilit times of Ovid's fables of mutant being, we are in metamorphosis. To be ignorant of these scientific and technological phenomena, to be indifferent to their effects on our mental and physical experience, *is to opt out of reason*. A view of post-classic civilization must, increasingly, imply a vision of the sciences, of the language-worlds of mathematical and symbolic notation.
>
> It is often objected that the layman cannot share in the life of the sciences. He is 'bound to remain for ever a dumbfounded savage' before a world whose primary idiom he cannot grasp. Though good scientists themselves rarely say this, it is obviously true. But only to a degree. Modern science is centrally mathematical; the development of rigorous mathematical formalization marks the evolution of a given discipline, such as biology to full scientific maturity. Having no mathematics, or very little, the 'common reader' is excluded. If he tries to penetrate the meaning of a scientific argument, he will probably get it muddled, or misconstrue metaphor to signify the actual process. True again, but of a truth that is half-way to indolence. Even a modest mathematical culture will allow some approach to what is going on. The notion that one can exercise a rational literacy in the latter part of the twentieth century without a knowledge of calculus, without some preliminary access to topology or algebraic analysis, will soon seem a bizarre archaism. These styles and speech-forms from the grammar of number are already indispensable to many branches of modern logic, philosophy, linguistics and psychology. They are the language of feeling where it is, today, most adventurous. As electronic data-processing and coding pervade more and more of the economics and social order of our lives, the mathematical illiterate will find himself cut off. A new hierarchy of menial service and stunted opportunity may develop among those whose resources continue to be purely verbal. There may be 'word-helots'.
>
> (98-100)

The second argument I would raise to substantiate my claim that mathematics has great potential as an element in general education is, in my opinion, more important than the banausic one although it is much less orthodox. It is the mathetic argument, and it rests on the assumption that *homo sapiens* is, in some fundamental sense, the mathematical animal.

Now the question of the nature of human nature is a well-known intellectual quagmire and not an area one wishes to plunge into in a brief paper. (Even Plato ran into trouble on this question. One day in the Academy he defined man as a "featherless biped". One of his students named Diogenes went home and got himself a rooster which he proceeded to pluck. The next day he entered with the naked rooster, threw it into the circle and said, "Behold! Plato's man.")

The mathetic view is implicit in many of the Platonic dialogues (1961) but perhaps emerges most clearly in the writings of George Boole. Bertrand Russell wrote that pure mathematics began in 1854 with the publication of Boole's Laws of Thought. In this book Boole states:

> The laws of thought, in all its processes of conception and of reasoning, in all those operations of which language is the expression or the instrument, are of the same kind as are the laws of the acknowledged processes of Mathematics. It is not contended that it is necessary for us to acquaint ourselves with those laws in order to think coherently, or, in the ordinary sense of the terms, to reason well. Men draw inferences without any consciousness of those elements upon which the entire procedure depends. Still less is it desired to exalt the reasoning faculty over the faculties of observation, of reflection, and of judgment. But upon the very ground that human thought, traced to its ultimate elements, reveals itself in mathematical forms, we have a presumption that the mathematical sciences occupy, by the constitution of our nature, a fundamental place in human knowledge, and that no system of mental culture can be complete or fundamental, which altogether neglects them.
>
> (422-423)

The twentieth-century philosopher who perhaps came closest to the mathetic view was Ernst Cassirer (1953) with his idea of man as *animal symbolicum.*

Recent writings which seem consistent with the mathetic view, one corollary of which, for instance, would be that language acquisition is essentially a mathematical process, would include some of the work of Piaget, Shannon, Bronowski, Polya, Chomsky, and Spencer Brown. The latter, in his book Laws of Form (1973) writes:

> The discipline of mathematics is seen to be a way, powerful in comparison with others, of revealing our internal knowledge of the structure of the world, and only by the way associated with our common ability to reason and to compute.
>
> (xv)

Historically, variations on the mathetic theme can be seen in the writing of Leibniz, Pascal, Pythagoras, Descartes, Whitehead, Weyl, Korzybski, Spengler, and Gauss. The fact that infant prodigies are exclusively a phenomenon of mathematics and its two sister areas, chess and music, may be taken as another indication of the validity of the mathetic argument. The curious cases of the *idiots savants* (Ball, 1974) may be another. If it is true that the human animal is in some way 'wired mathematically' then surely it is consistent to contend that mathematics should constitute an important aspect of any scheme of general humanistic education.

But what of the reality of mathematics education? If, as has been contended, mathematics can claim to have considerable educational potential, how well is this potential being realized? There are many indications that the gap between potential and reality is very large, and that far from being a vehicle for human liberation and a means to an appreciation of truth and beauty, mathematics for many people has been an instrument of repression and fear.

The public image of mathematics has never been particularly good. In the seventh century, St. Augustine felt compelled to say, "The good Christian should beware of mathematicians and all those who make empty prophecies. The danger already exists that the mathematicians have made a covenant with the Devil to darken the spirit and confine Man in the bonds of Hell!" (Kline, 1954, p.3). Rousseau in his Confessions (1970) tells of an evening in Vienna spent in the company of a lady of less than spectacular virtue. We are spared details of the evening itself - (it appears that behavioral objectives were applied in those days as well) - but the next day the lady in question gave Jean-Jacques the following advice - "Give up the ladies and take up mathematics." (p.302). Stephen Leacock, the Canadian humourist (in this context it is also worth noting that Leacock was not a northern version of Will Rogers but rather a distinguished academic with a doctorate from the University of Chicago who was for many years head of the Economics Department at McGill University) reflected one time on his mathematical education, and he said as follows: "My attitude towards mathematics indeed is that of nine out of ten educated people - a sense of awe, something like horror, a gratitude for escape, but at times a wistful feeling of regret, a sense that there might have been a little more made of it".

Mathematicians recognize the public attitude towards their discipline as a social hazard. Many of us who at cocktail parties have confessed to being mathematicians by profession have been subjected to horrendous tales of personal ineptitude which, I suspect, are not elicited by any other area. Paul Halmos (1968), a distinguished contemporary mathematician, has written that on social occasions like this, or when travelling on aeroplanes, he's very tempted to tell people he's "in roofing and siding" (p.375).

How, then does this come about? The Mona Lisa is not used as a weapon. Why should an aesthetically appealing - (Whitehead (1948) called it "the most original creation of the human spirit" (p.25)) - construction like mathematics have become an object of fear, suspicion, and distaste in the minds of many able people? I think this is a specific illustration of the 'Mark Twain cat syndrome'. Anticipating the work of Professor Skinner by a number of years, this cat had absorbed its lessons well, for the unfortunate beast had once sat on a hot stove. Twain observed the cat, being an intelligent beast, never again sat on a hot stove but, on the other hand, it never sat on a cold one either.

The answer is to be found, in my opinion, in the way in which these people encounter the discipline, that is, in the way in which it is taught. Let me try to illustrate this point by two quotations. The first comes from Surprised by Joy (1959), the autobiography of C.S. Lewis (1898-1963) who, although a professor of English Literature at Oxford, is best remembered for his religious books such as The Screwtape Letters.

In the second chapter of Surprised by Joy, Lewis describes his school days and we're given a foretaste of what is to come by the title and the epigraph of the chapter which are, respectively, "Concentration Camp" and "Arithmetic with Coloured Rods". The passage is, so to speak, a striking one. He is writing about a school experience he had as a child of the age of twelve and one cannot help but be grateful that we have progressed so far, in some ways, in the last sixty-five years. It does not seem likely that this man who has influenced in a minor way the shape of our contemporary world, could avoid strong negative feelings in association with mathematics. We enter Surprised by Joy at the point where Lewis recalls the headmaster of his prep school, Oldie, and P, a fellow pupil who has made a mistake in a geometrical proof.

> I have seen Oldie make that child bend down at one end of the schoolroom and then take a run of the room's length at each stroke; but P. was the trained sufferer of countless thrashings and no sound escaped him until, towards the end of the torture, there came a noise quite unlike a human utterance. That peculiar croaking or rattling cry, that, and the grey faces of all the other boys, and their deathlike stillness, are among the memories I could willingly dispense with.
>
> The curious thing is that despite all this cruelty we did surprisingly little work. This may have been partly because the cruelty was irrational and unpredictable; but it was partly because of the curious methods employed. Except at geometry (which he really liked) it might be said that Oldie did not teach at all. He called his class up and asked questions. When the replies were unsatisfactory he said in a low, calm voice, "Bring me my cane. I see I shall need it." If a boy became confused Oldie flogged the desk, shouting in a crescendo, "Think - Think - THINK!!" Then, as the prelude to execution, he muttered, "Come out, come out, come out." When really angry he proceeded to antics; worming for wax in his ear with his little finger and babbling, "Aye, aye, aye, aye...." I have seen him leap up and dance round and round like a performing bear. Meanwhile, almost in whispers, Wee Wee or the usher, or (later) Oldie's youngest daughter, was questioning us juniors at another desk. "Lessons" of this sort did not take very long; what was to be done with the boys for the rest of the time? Oldie had decided that they could, with least trouble to himself, be made to do arithmetic. Accordingly, when you entered school at nine o'clock you took up your slate and began doing sums. Presently you were called up to "say a lesson." When that was finished you went back to your place and did more sums - and so for ever. All the other arts and sciences thus appeared as islands (mostly rocky and dangerous islands)
>
> > *Which like to rich and various gems inlaid*
> > *The unadorned bosom of the deep*
>
> - the deep being a shoreless ocean of arithmetic. At the end of the morning you had to say how many sums you had done; and it was not quite safe to lie. But supervision was slack and very little assistance was given. My brother - I have told you that he was already a man of the world - soon found the proper solution. He announced every morning with perfect truth that he had done five sums; he did not add that they were the same five every day. It would be interesting to know how many thousand times he did them.
>
> (28-29)

If this case was an aberration it would perhaps be no cause for concern. Unfortunately, autobiographical literature reveals a high proportion of experiences like this. Jung, for instance, in Memories, Dreams, Reflections (1965) is another good example. Robertson Davies in World of Wonders (1975) has one of his characters muse, "Do you suppose the devil invented numbers?" (p.60). (Perhaps an analyst - Jungian or otherwise - might connect this statement to the fact that Davies dropped out of Queen's University in 1935, unable to pass first year mathematics.) W.H. Auden, in one of his briefest and least well-known poetic efforts, gives us some insight into his mathematical education:

> *Minus times minus equals plus.*
> *The reason for this we need not discuss.*

My second illustration is taken from more recent times, a passage from a book by the late American anthropologist, Jules Henry (1963). Instead of haring off to Brazil to study the exotic natives, he stayed at home in St. Louis for a few years and studied the exoteric natives there. The result of that study was a book called Culture Against Man which has a chapter called "Golden Rule Days: American Schoolrooms". In this chapter there is a scenario starring an unfortunate young man named Boris who is also encouraged to "think". I suggest that many of us can identify to a certain extent with him. Henry has some powerful observations to introduce and comment on the scenario.

> In a society where competition for the basic cultural goods is a pivot of action, people cannot be taught to love one another, for those who do cannot compete with one another, except in play. It thus becomes necessary for the school, without appearing to do so, to teach children how to hate, without appearing to do so, for our culture cannot tolerate the idea that babes should hate each other. How does the school accomplish this ambiguity? Obviously through competition itself, for what has greater potential for creating hostility than competition? One might say that this is one of the most "creative" features of school. Let us consider an incident from a fifth-grade arithmetic lesson.

### *At the Blackboard*

> Boris had trouble reducing "12/16" to the lowest terms, and could only get as far as "6/8". The teacher asked him quietly if that was as far as he could reduce it. She suggested he "think". Much heaving up and down and waving of hands by the other children, all frantic to correct him. Boris pretty unhappy, probably mentally paralyzed. The teacher, quiet, patient, ignores the others and concentrates with look and voice on Boris. She says, "Is there a bigger number than two you can divide into the two parts of the fraction?" After a minute or two, she becomes more urgent, but there is no response from Boris. She then turns to the class and says, "Well, who can tell Boris what the number is?" A forest of hands appears, and the teacher calls Peggy. Peggy says that four may be divided into the numerator and the denominator.

Thus Boris' failure has made it possible for Peggy to succeed; his depression is the price of her exhilaration; his misery the occasion for her rejoicing. This is the standard condition of the American elementary school, and is why so many of us feel a contraction of the heart even if someone we never knew succeeds merely at garnering plankton in the Thames: because so often somebody's success has been bought at the cost of our failure. To a Zũni, Hopi, or Dakota Indian, Peggy's performance would seem cruel beyond belief, for competition, the wringing of success from somebody's failure, is a form of torture foreign to those noncompetitive redskins. Yet Peggy's action seems natural to us; and so it is. How else would you run our world? And since all but the brightest children have the constant experience that others succeed at their expense they cannot but develop an inherent tendency to hate - to hate the success of others, to hate others who are successful, and to be determined to prevent it. Along with this, naturally, goes the hope that others will fail. This hatred masquerades under the euphemistic name of "envy".

Looked at from Boris' point of view, the nightmare at the blackboard was, perhaps, a lesson in controlling himself so that he would not fly shrieking from the room under the enormous public pressure. Such experiences imprint on the mind of every man in our culture the *Dream of Failure*, so that over and over again, night in, night out, even at the pinnacle of success, a man will dream not of success, but of failure. *The external nightmare is internalized for life.* It is this dream that, above all other things, provides the fierce human energy required by technological drivenness. It was not so much that Boris was learning arithmetic, but that he was learning the *essential nightmare. To be successful in our culture one must learn to dream of failure.*

(295-296)

If it is true, as I have contended, that for mathematics as an element of education the gap between the potential and the reality is very large, what can be done to narrow this gap and hence make mathematics a more satisfying and worthwhile curriculum experience for students in the future?

Since space is short, I will merely list fifteen steps which, in my opinion, would alleviate the situation. Although many of the points refer specifically to mathematics education, several transcend subject boundaries and are, in my opinion, appropriate for other disciplines as well. While I have not consciously played the devil's advocate, I do believe, with Sir Karl Popper, that the purpose of a paper is to provoke and hence have made no attempt to be other than blunt here.

1) We must educate the public about the nature of mathematics; the widely held view that mathematics is the science of number and space should be updated (Whitehead, 1948b) perhaps to the Bourbaki (1971) view that mathematics is 'the science of structure' (Weissinger, 1969) to more accurately catch the flavour of contemporary mathematics. (In this sense Freud was perhaps ahead of his time in being able to conceptualize different types of mathematics. He spoke at one time of the strange arithmetic of women; that one is too many and many is not enough.)

2) This is particularly true in the case of teachers, that is, the necessity of changing their vision of mathematics. Here, however, the question of attitude is central (Beltzner, 1976). Steps must be taken to improve the attitude of mathematics teachers, especially at the elementary school level, toward the subject. For many situations in the elementary school, the conception of mathematics as the science of pattern will be quite adequate (Sawyer, 1955; Whitehead, 1948c).

3) We must attempt to change teachers' perception of their own role away from the image of dispenser of information in the direction of the teacher as a model of an active learner (Higginson, 1973); this change should stress the importance of personal and professional growth.

4) This change in teacher role will be consistent with a curriculum emphasis on the dynamic process of mathematizing (Wheeler, 1974; Mason, 1976) rather than on the static product of this process which is mathematical fact. Einstein once made a distinction between science, the finished

product, a cold inhuman thing, and something very human, on the other hand, which he called 'science coming into being' (Holton, 1973, p.212). I think we have a very strong case for making mathematics coming into being part of our mathematics curricula (Polya, 1962, 1968, Lakatos, 1976).

5) We must stress, much more than we presently do, the historical roots (Menninger, 1969; Eves, 1976; Bronowski, 1973) and the contemporary applications (Holt, 1973); Science Council, 1974; Stevens, 1974) of mathematics; in particular we should emphasize the relationships between mathematics and the physical sciences (Hoyle, 1977; Polya. 1977; Kline, 1969).

6) The aesthetic and philosophical aspects of the subject (Heisenberg, 1972; Fuller, 1975; Critchlow, 1976; Capra, 1975) should be given much more prominence. We should, as well, stress mathematics as an ecologically sound recreation. When the 'cumulative horsepower equals status' era comes to an end - as it soon will - mathematics offers a clean, inexpensive, and non-polluting high.

7) The range and type of evaluation in mathematics should be considerably expanded (Association of Teachers of Mathematics, 1968).

8) Helping students learn 'how to think' should be seen as the major curriculum goal in mathematics; this will imply an emphasis on mathematical problem-solving (Polya, 1957, 1962).

9) The mathematical community must give educational considerations a higher priority than is now the case (Beltzner, 1976).

10) We need to carefully examine the implications and constraints of psychological and philosophical models on which mathematics curricula might be based; this is especially true, for example, in the areas of cognitive development, individualized instruction, and remediation. Neo-behaviourism, for example, should be seen as an inadequate theoretical base for all but the most trivial aspects of mathematics (Piaget, 1971; Kaufman, 1973; Bertalanffy, 1967; Koestler, 1970; Educational Technology, 1972).

11) We need to reject research paradigms and methodological techniques coming from other areas which are clearly inappropriate; the management version of teacher accountability and the very great percentage of educational research models fall into this category. For decades education has been the research design equivalent of clapped-out autos for Argentina. Just as the patched-up Packards and Corvairs of the world chug along the streets of Buenos Aires today, in educational research third-hand models with scientific pretension sputter along producing nothing significantly different in still another comparative study. Flow charting did not win the war in south-east Asia for the Pentagon and it cannot be seen as an appropriate technique for education in any true sense of the word. An immediate corollary of this is that we need to generate our own models and techniques (Educational Technology, 1973; Piaget, 1976; Hilton, 1975; Ginsburg, 1977, Krutetskii, 1976; Romberg, 1975).

12) The view that 'knowledge is power' (by Archimedes out of the Rand Corporation) leading to things like megadeath estimates, needs to be supplemented by the neo-Pythagorean view of 'knowledge is wonder'; the potential of mathematics as a route to higher orders of consciousness should be explored (Thompson, 1971; Ghyka, 1971; Musès, 1974; Young, 1976).

13) Mathematicians must become more aware and active in the area of social responsibility (Grothendieck, 1971).

14) The dangers of neo-Aristotelian either-or thinking, as exemplified in very common statements, particularly south of the border, such as 'America: Love it or Leave it', 'Live free or die', 'Are you with us or against us?' - should be revealed and pointed out as a case of inappropriate mathematical modelling. The 0-1 model is far too primitive for the issues to which it is often applied. The related issue of a misplaced emphasis on classification should also be considered (Korzybski, 1958; Hilton, 1975; Thompson, 1971: National Advisory, 1975).

15) Disciplinary specialization has been carried much too far in the academic world. There is a need to develop a system of education which, more than being interdisciplinary, is transdisciplinary. Such a system of integrative education can be based on a small number of fundamental organizing

concepts such as symmetry, transformation, duality, continuity, and system (Margenau, 1972; Waddington, 1977). Whitehead was sensitive to the power of "big ideas" and the connection of mathematice to these ideas. "Nobody can be a good reasoner unless by constant practice he has realised the importance of getting hold of the big ideas and hanging on to them like grim death" (1949, p.87). "Mathematics well taught should be the most powerful instrument in gradually implanting this generality of idea. The essence of mathematics is perpetually to be discarding more special ideas in favour of general methods" (1949, p.60). Mathematical ideas would play a central role in integrative education. The concept of form would seem to be a particularly rich area (Thompson, 1969; Schwenk, 1965; Thom, 1975; Whyte, 1968).

As a final statement let me say that, in my opinion, if we should succeed in some of these tasks we might come somewhat closer to achieving the view of mathematics described some fourteen years ago by the distinguished mathematician and educator, Alexander Wittenberg, whose untimely death was a major blow to mathematics education in Canada. Wittenberg's statement (1963, p.1097), which I would like to close with, goes as follows:

> Mathematics exists, not as a defined entity in some logician's or philosopher's textbook, but first and foremost as a living reality, as a fact of life. We strive to understand it as we strive to understand all the other manifold aspects of our experience from physical nature to the nature of poetry. And we find ourselves faced with the same mixture of answered and unanswered questions, of insight and puzzlement, that is everywhere characteristic of the human situation.

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# THE FINE ARTS:
# ITS NATURE, ROLE AND FUTURE

D. Keane

> *Artistic creativity is perhaps the most human of all intellectual qualities. Whereas it might be argued that intelligence and the capacity to communicate are only higher in degree in humans than in animals, artistic creativity and appreciation are absolutely unique to human beings.*
>
> (Roederer, 1975, p.11)

If the above statement is true, if man's special quality is his capacity for artistic communication, it would be a capacity of considerable value for us to understand. Dance, music, art, and poetry are traditions which must extend back very far into pre-history. Yet we seem little closer to understanding the elementary structure and function of artistic communication today than the earliest commentators on the philosophy and mechanics of artistic expression. To be sure, we have in our possession a proliferation of grammars that describe the superficial behaviour of particular idioms and styles. But Michael Polanyi (1958) has made the point: "Rules of art can be useful, but they do not determine the practice of art; they are maxims, which can serve as a guide to an art only if they can be integrated into the practical knowledge of the art. They cannot replace this knowledge" (p. 50). What Leonard Meyer (1973) has said of music can be applied to the arts generally:

> Understanding music, to paraphrase what Bertrand Russell has said of language, is not a matter of knowing the technical terms of music theory, but of habits correctly acquired in oneself and rightly presumed in others. Listening to music intelligently is more like knowing how to ride a bicycle than knowing why a bicycle is ridable.
>
> (p. 16)

There are then two levels to examine in artistic communication:

1. The semantic message, expressible in symbols, communicating translatable logical decisions.
2. An aesthetic message, communicating, for want of a better term, emotional states which are perhaps untranslatable.

(Abraham, 1966, pp. 167-168)

I hope to show that, no matter how sophisticated the aesthetic message, it is somehow encoded in the semantic message. Art is transmitted first to the senses and if we are to understand how aesthetic communication works, we must try to understand how sensory perception interacts with intellect and emotion. This is not to say that such an understanding will necessarily provide the answers to all of our questions. But to overlook sensory systems and jump from the transmitted message to the intellect is certain to lead to unnecessary mysteries and misconceptions.

Before we can even begin to examine the aesthetic message, we must conduct at least a cursory examination of the semantic in at least one medium. While the various artistic media probably share essential problems, there are too many intra-media variables to examine all of them. Among the arts, music is the least representational. An examination of music, then, will allow us to decipher the components of artistic communication with the least entanglement of levels of meaning.

The essential ingredient of music is sound. The vibration of matter (string, vocal cords, etc.) causes waves of similar patterns in the air. Should those waves reach a normal ear, they are conducted through a rather remarkable mechanism which converts them first to vibrations in solids (middle ear) then in liquid (inner ear) and then to electrical pulses sent along the auditory nerve to the cerebral cortex of the brain. There is some evidence that at this point the integration of sensory information may take place in the brain. For example, a certain brain cell will release an electrical discharge when a sound is perceived at a particular point in three dimensional space. The self-same cell will discharge in the same manner when the organism perceives, not an aural but a visual cue at the same point in space. It may, therefore, not be too much to hope that once sensory information has been transmitted to the brain, artistic communication receives the same processing at the aesthetic level irrespective of the actual medium.

If music is conveyed to the brain by means of vibrations in the air, all of the necessary information must be contained in the component parts of those vibrations. There are three basic components. All other aspects of sound are a combination of these basic variables:

1. frequency - the speed with which successive peaks and valleys of the waves meet the ear mechanism.

limits: lower - 20 Hz (.05 sec.)
upper - c. 20kHz ($7 \times 10^{-5}$ or .00007 sec.)

2. amplitude - the loudness of a sound, or more accurately the extent of the displacement of the vibrator (or air, or parts of the ear mechanism).

   limits: lower - movement of the ear drum as little as $10^{-7}$cm (.0000001 cm)
   upper - the threshold of physical pain

3. duration - the period from the beginning to the end of a sound object.

   limits: lower - between 2 and 20 complete vibrations depending upon the frequency and amplitude.
   upper - a sound which continues without variation will cease to be notices until it is turned off when we suddenly realise again that it had been there.

(Roederer, 1975, p. 5)

Other basic aspects of music require variations of combinations of frequency, amplitude, and duration. Rhythm is merely the co-ordinated presence and absence of frequency and amplitude. Timbre or tone colour is the result of combinations of simultaneous frequencies, each with its own amplitude. (We perceive a difference between a middle C played by a french horn and a trumpet, for example, largely by timbre.) Tone envelope is the manner with which a tone begins, continues, and concludes with respect to the amplitude of each of the frequencies comprising the timbre. (We perceive a difference between a violin tone, which begins with the scraping of the bow on the string followed by a more or less steady tone, and a piano tone, which begins with a thud of the hammer and steadily grows softer, by means of tone envelope.) Melody is a combination of rhythm and frequency. Harmony is a combination of melodies. Melody and harmony are used to build yet more complicated structures.

We must return our attention to the three basic variables in order to see clearly how these variables work. We have seen the meaning of frequency, amplitude, and duration to the ear but not to the mind.

Tension, its rise and fall, is central to all art. In fact its ebb and flow measures off every aspect of our lives. We can make some observations about tension in relation to each of the basic variables we have considered. The following are generalizations (Schafer, 1969, p. 19), to which there are exceptions, and, as we have already seen, none of the basic variables can function in isolation from the others:

frequency: as the pitch rises - tension rises
amplitude: as the sound grows louder - tension rises
duration: as the sounds are faster and more irregular - tension rises

In all of the above, extremes and erratic changes will also cause a rise in tension. Musical tension levels may in fact perceptibly affect physiological processes. The pulse rate can be accelerated or slowed by corresponding changes in rhythm. Moderately high amplitudes can affect the nervous system and provoke constrictions in a large part of the blood circulation system. Certain frequencies are considered to have special effects on parts of the human body: ". . . it has been discovered that the average human anal sphincter resonates at about 77 cycles. If it resonates hard enough it can no longer be controlled. Police have experimented in the control of mobs by employing loud sounds of this frequency" (Schafer, 1969, p. 31).

In my experience, music has so far not achieved this last effect. It can be observed, however, that there is a relationship between the sounds produced in a musical context and the tension state of the listener. Infinite combinations of the basic variables can produce equally infinite variations in tension. A piece of music, then, is formed, in part, by the complicated patterns of tension in constant flux. At times variables are pitted against one another to produce middle states of tension while at other times all variables are rallied to produce the extremes of tension. The speed, loudness, and melodic intensity of the rousing finale contribute to only one of the more obvious of the possibilities.

If we have succeeded in isolating the elemental features of music, we have only identified the parts of Meyer's bicycle and some aspects of how it works. We still do not know how to ride it.

In the early sixth century, Boethius summarized the musical views of classical antiquity in his *De institutione musica* (ed. Strunk, 1950). In regard to the effect of music he writes: ". . . discipline has no more open pathway than through the ear. When by this path rhythms and modes have reached the mind, it is evident that they also affect it and conform it to their nature" (p. 81). The modes to which he refers are essentially relationships of the tones or frequencies used in Ancient Greek music (Book 1, Chapter 10). Boethius tells a tale concerning these frequency relationships that is still being quoted three hundred years later by, among others, Aurelian of Reome (ed. Seay, 1972):

> The Greeks say that one day Pythagoras was passing by the forges of the smiths and heard the blows of the hammers somehow produce a single harmony out of different sounds; excited over what he had long been seeking--namely, how he could discover the properties of consonances--he approached in amazement, and, noticing that many hammers made one consonance, he thought that the difference in pitch was caused by the strength of the hammerers. This property of the sound, however, did not depend upon the muscle of the men, but upon the size of the hammers. In such a way, then, did the aforesaid Pythagoras discover how different proportions are related to consonant sounds, as can easily be shown, by way of illustration, with four hammers, if they should correspond to the numbers inserted here: XII, IX, VII, VI. . . .

This story appears in nearly every treatise on music until the early Renaissance even though the authors and their readers must have been a good deal more familiar than we are with smiths and their hammers. But no writer that I have encountered has ever pointed out that hammer measurements would have been meaningless to Pythagoras since it is the anvil or metal stock which is being struck rather than the hammer which produces the tone one hears emanating from the forge. It is perhaps not surprising, then, that none of these writers has observed that Pythagoras' proportions: 12:6 (2:1 - the octave), 9:6 (3:2 - the fifth), 12:9 (4:3 - the fourth) and so on, were the ideal and that in practice human and mechanical imperfection produces much more complex ratios. I will refer to this again.

In 1712, the philosopher and mathematician, Gottfried Leibniz, wrote in a letter to a friend: *"Musica est exercitium arithmeticae occultum nescientis se numberare animi"* ("Music is a veiled exercise in arithmetic by the soul unaware of its counting") (Saminsky, 1957, p. 2). In 1967, the mineralogist, Professor Dr. G.C. Amstutuz (1967) said:

> The pythagoreans were aware of the relation between musical harmony and simple integral number. They had performed the experiment of plucking a single note on a stretched string . . . and then sounding that note one octave higher by shortening the string to exactly half its length. . . . In other words, the numbers of vibrations are in the ratio of 2:1. . . . This is the relationship pointed out by Pythagoras. What is of great interest is the fact that the horizontal chains of overtones which arise from the fundamental tone according to the ratios of string length are similar to the atomic intervals in crystal

> lattices. The science of harmony in music is, in these terms, practically identical with the science of symmetry in crystals. Indeed, the crystals can now literally be seen to be . . . frozen music . . .
> (pp. 10-11)

There is some doubt about the importance of these ratios in music, however. The psychologist, Wendell R. Garner (1962) states:

> . . . a judgement of the redundancy of a unique figure (or judgements of other characteristics presumably related to redundancy) is not really a judgement of the redundancy of the figure itself (which is a meaningless judgement) but rather is a judgement of the redundancy of the particular subset of figures from which the unique figure is presumed to have come.
> (pp. 204-205)

He later says that we resolve information (including sets of pitches or frequencies) into the simplest possible set. That is, when we encounter collections of similar entities we tend to assume that they are drawn from a repertoire no larger than one which would account for the entities we have observed. We do not normally attempt to consider possibilities of entities that might also be in that collection or repertoire but which are not in evidence. If by a slight adjustment of certain entities we can resolve the hypothetical repertoire into a smaller one, we tend to do so. Consequently, we tend to accept a very imperfect octave as a ratio of 2:1. But if we are to that degree indiscriminant, can simple number ratios be as much the essence of music as has been suggested since the time of Pythagoras? In fact, with the advent of electronic synthesis, we have discovered that we do not even want the absolute perfection that musicians have long sought. An electronically generated melody which has perfect attacks, tones which are quite steady with respect to amplitude and frequency, and precise ends of notes is quite dull and would be said to be "unmusical". Composers of electronic music must take considerable pains to introduce slight but perceptible levels of random variation in frequency, timbre, amplitude, and duration in electronically produced sounds to give them the same depth of character as acoustically produced sounds. If we have learned anything here it is about mathematics or crystals. As for music, we are still looking at bicycle parts.

What about the theme or motif? For well over two hundred years, composers and analysts have focused attention on the musical theme, a melody (perhaps combined with a harmony, perhaps associated with a particular frequency centre, or tonal centre) which is repeated and expanded and varied and restated in many ways. The bulk of traditional music theory and analysis is devoted to the hierarchical structures made of these motivic building blocks. Herbert A. Smith has said: "If there are important systems in the world that are complex without being hierarchic, they may to a considerable extent escape our observations and understanding. Analysis of their behaviour would involve such detailed knowledge and calculation of the interactions of their elementary parts that it would be beyond our capacities of memory or computation" (Simon, 1962, p. 477). If we are to comprehend anything so abstract as music we must depend on its hierarchical organization. But the music theorist, Donald F. Tovey (1942), suggests that motivic manipulation falls rather short of being a complete answer:

> Nothing is easier than to derive any musical idea whatever from any other musical idea; and a long chain of such derivations is often supposed to embody the logic of music. In itself it can give us no security that it is more logical than a series of puns.
> (p. 50)

Leonard Meyer (1956) makes the point more eloquently:

> . . . music theorists, aestheticians, and critics, who, enticed and befuddled by the honorific garlands so plausibly bestowed upon regularity, symmetry, and pristine clarity, have continually construed "inevitability" to mean unequivocal progression. These Scholars, in their intricate and ingenious attempts to derive all the melodic materials of a musical work from a single motivic "germ" or to subsume all harmonic changes under the structure of a single cadence, have with Talmudic tenacity confused both unification and uniformity with unity. Yet the fact of the matter is that some of the greatest music is great precisely because the composer has not feared to let his music tremble on the brink of chaos, thus inspiring the listener's awe, apprehension, and anxiety and, at the same time, exciting his emotions and his intellect.
> (p. 161)

There is something then beside mathematical balance, something other than clever statement and variation that conveys meaning to the listener. Current thinking places considerable emphasis on the antecedent-consequence relationship distributed throughout the many levels of a work. Musical meaning arises when an antecedent, requiring speculation of the likely continuation of the pattern produces uncertainty about the nature of the expected consequent. Possible means of achieving musical meaning in this sense are:

(i) delay of the normal or probably consequent event

(ii) ambiguity of the antecedent (several equally probable events are suggested)

(iii) the consequent is not the probable one

The possible variations can become very much more complicated but I have suggested enough to portray the kind of relationship between the music (i.e. the composer/performer) and the listener (Meyer, 1967, pp. 6-15). He compares the music listener in this relationship to an individual driving on a familiar road: ". . . attention is not focused--cars, pedestrians, etc. are dealt with out of habit. But if a car swerves into the middle of the road or a striking landscape attracts attention, the stimulae become meaningful" (p. 9).

In this context some aspects of information theory have proven useful. The response of the individual (receiver) is determined by complex forms arising from a sequence of elements chosen from a repertoire. The messages are measured by the quantity of information they convey, that is, the originality or quantity of unpredictability that they represent (Moles, 1966, pp. 53-55). A piece of music which is totally random in its events, however, does not convey the maximum information because it quickly becomes apparent that the pattern is: randomness. The music is therefore predictable in its behaviour. Maximum information, therefore maximum musical meaning at this level is dependent upon a delicate balance between redundancy and caprice. It is these that composers have been juggling since the beginning of musical communication.

We have seen two levels of meaning drawn from musical communication: one at the primitive level of physiological response and the second which is barely more than a game of cat and mouse. There is obviously a good deal more about music that must be uncovered if we are to fully understand what is happening to us as we listen. Game theory, linguistics, and artificial intelligence are just several of the current lines of investigation. But these are all at the level below the concept of the composition as a single entity. I would be remiss if I were not to mention one additional line of inquiry on the macro-musical level. Murray Schafer (1969, 1974), one of Canada's leading composers, regards all sounds in the world as a huge musical composition which unfolds around us ceaselessly and in which we are simultaneously its audience, its performers, and its composers. As such we must develop an awareness of the sounds in our environment which have receded below our consciousness; traffic noises, fan noises, Muzak, background radio, etc. Some of these sounds are even harmful and are contributing to a rapidly increasing level of hearing impairment in the industrialized societies of the world but by no means confined merely to workers in factories. The boring or destructive sounds should be eliminated while the more desirable sounds should be preserved, encouraged, and multiplied. Perhaps both the role and the future of music lies in what Schafer (1974) calls soundscape studies: "Acoustic design is not merely for acoustic engineers. It is a task requiring the energies of many people; professionals, amateurs, young people--anyone with good ears; for the universal concert is always in progress, and seats in the auditorium are free" (p.10).

The implications for the other arts are obvious: we are at all times, both consumers of art as we are creators of art. We are, then, obligated to know about them, how and why they function. Only through massive investigation--on the micro-level and the macro-level, from the intensive view of specialists and through the perspective of interdisciplinary researchers--will we be able to obtain answers. But, most importantly, we must sensitize our students to discover and fulfill their role in the world "art-scape", both for their personal growth and for the worth of our world.

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# A FUTURES ORIENTED SCIENCE CURRICULUM

J. K. Olson

There seems to be an irresistible urge on the part of science teachers in schools, of late, to have someone else tell them what to teach--this urge takes the form of a demand for core subject matter for science. As the apple has a core--so must science in schools. If we accept that the urge for core subject matter is of the type that propels lemmings to the sea--that is, it is irresistible--then perhaps we should consider carefully what we should be on about in school curriculum. After all, students are compelled to attend school, now compelled to take science once in high school and soon all must take some aspect of science in common. Clearly science is thought to be compulsive. Now this is a serious matter. As J.R. White (1973) says in his book Towards a Compulsory Curriculum we simply have no right to make children learn things for inadequate reasons. My fear is that we are in danger of doing just this in compelling both the taking of science and the taking of compulsory aspects of it. As White ably demonstrates, it is a very difficult task to mount defensible arguments for compelling students to do other than that which they would choose to do.

I'd like to consider briefly what we might take to be compelling about science and--in effect--to launch a modest attempt at justifying compulsory science.

To do this I want to review some of the more extravagant claims for the curative, restorative emetic, lenitive and embrocative properties of science--or plainly--why some think science is good for you. These claims I will suggest should be viewed with some skepticism.

Following this I'd like to develop a perspective on science teaching which I think has merit as a basis for a common compulsory subject in high school. In doing this I want to keep in mind that we are thinking of of something that all students must take whatever their background. We are also thinking that in compelling them to submit to our ministrations, we have their interests at heart--in other words we tread cautiously when we compel--this being the spirit of J.R. White's point referred to earlier.

## Core Curriculum and the Methods of Science

Back in 1961 we had a core curriculum--in fact--there wasn't any flesh--it was all core and seeds. There was enough to keep the indolent in a state of continuous guilt and the diligent frustrated. This core emphasized facts and more facts. Little was said about the methods of science.

Now the approach to science teaching which tends to emerge from such specifications was rejected a while back--most emphatically by H.E. Armstrong (Van Praagh, 1973)--the inventor of the heuristic method of science teaching. Armstrong was busy crusading for learning by discovery back in 1898 in much the same spirit as the Hall-Dennis Report. Armstrong was sure that learning by doing had many valued properties. Most if not all of the virtues he lists would feature on lists of why teach science produced by teachers today. Science helps develop certain aspects of rational thinking, if you teach it in the right way--that is--by discovery. What Armstrong is saying is that it is enough to introduce students to the methods of the scientist and let them use these methods. There are two ways we can look at this approach. One way stresses the puzzle solving aspects of the discovery approach. Students are given various problems to solve, often rather esoteric ones, and told to get on with it. This can be amusing. The other view stresses the critical feature of science; science as a method of continuously criticizing what it knows. We parallel here Kuhn's notion of fluid and stable inquiry. My view is that schools tend to portray science as stable. This easily degrades into puzzle solving and limits the educational potential of science. However a necessary basis for the curriculum I propose would be getting students involved in the critical aspects of science. I'd like to deal with some of the limitations of the puzzle solving approach and later indicate how the critical approach would be important.

## Science as Puzzle Solving

What Armstrong is proposing is a form of puzzle solving. The puzzle is the thing--what the puzzle is about is not. It is as if we recommend an approach to school science work, which highly values doing jigsaw puzzles--what picture emerges isn't at issue or if it is, the burden of the arguments rests on acquiring information useful in getting on in further states of puzzle solving and eventually earning a living. (Parenthetically, this is the picture Armstrong saw as holding the pieces together.) But the puzzle solving is the thing we hang the educational argument on. Puzzle solving is good for you, much as doing the Sunday Times crossword puzzle is. But who says? You could argue it is a matter of taste.

Not everyone likes to solve puzzles whose relevance to their here and now isn't clear. Such puzzle solving requires a suspension of reward for many and a suspension of one's more immediate concerns. You could say that puzzle solving and its attendant characteristics appeal to those who have been brought up to it, just like betting on the dogs appeals to those brought up that way. Those who are prepared to solve puzzles chosen by the teacher may be those in the society who realize that by participating they will get ahead, although for their here and now the point seems remote. Now I don't propose we teach students how to bet on the dogs. That we should want to use our valuable school time in other ways is clear. But why? We have to take seriously the view that just because school teachers enjoy doing their disciplines, it does not follow that we should insist that school children also do them. This is no justification!

## Problems with the Puzzle Solving Approach

Now I am not saying that the kinds of exercises we develop for science students are worthless--far from it. What I am saying is that they cannot be the hook--the focus--upon which we hang compulsory science. The problem is that--puzzle solving is amusing for some, possibly educative, but limited in value and limited in educative potential.

Why limited in these ways? Nell Keddie (1970), a British sociologist, has studied classroom transactions with a view to seeing what use teachers make of their disciplines. What she finds is that teachers claim publicly that all pupils are capable of a sensible rational approach to their studies. In practice they tend to see as irrational and unschoolable those students who are not prepared to enter into an unwritten agreement with the teacher about the value of the puzzle solving the teacher wishes to engage in. Those pupils who wish to use their own language and their own meaning systems and who reject the imposition of an unjustified disciplinary perspective on the world are rejected. Teachers, she says, appear to define pupil ability in terms of a willingness to abandon every day knowledge in favour of alternative thought systems. Not all children are prepared to do this. Not only that, but I doubt whether in compulsory schooling in science they should be asked to. That we should teach so as to negate or disvalue the views about their experience that children bring to the classroom seems an odd basis for education. Yet, if we can believe Keddie (and many others) this is exactly what happens. It is because of the teachers' commitment to what they take to be the methods of the science (and this is usually inaccurate and incomplete) that we run into problems.

## A Futures Oriented Curriculum

L.R. Perry (1965) in his paper on commonsense thought makes the point that the notion that commonsense is to be superseded where possible is based on a misapprehension of what commonsense is for. Commonsense thought, he says, is concerned with problems of personal policy rather than increasing knowledge or solving theoretical puzzles. It is the process of decision making, of deliberating, of weighing evidence and values. Here we begin to catch a glimmer of what might serve as the basis for a compulsory science course.

John Wilson (1972) in his book for teachers on methods of moral education says people in the area of personal policy appear to act on impulse. They do not plan, form policies, nor consider effects of action. In other words, they do not appear to use their commonsense effectively. The task of commonsense, after all, is not to act as if it were after specialized or theoretical knowledge but to relate relevant types of expert knowledge to the situation with which it is to deal.

We can now argue that a very useful thing we could do for students, through the use of our subject matter, is to help them learn how to more effectively make important decisions. This would certainly be doing something valuable; for in exchange for having to sit in our classrooms, we offer enhanced possibilities of effective future choosing, of improved decision making, of improved chances to make sense of the social, political, economic webs "out there." Allied to this is the help students would gain from participating in critically oriented science. The critical spirit exemplified by fluid inquiry is much the sort of spirit that we hope they will bring to decision making processes. We must add to this that in order to learn to make wise decisions, there must be opportunity for practice. What better area for considering what one should do than those areas of practical concern related to science? If we take the need for effective decision making as our key--the penetration of science into this domain is significant and difficult to escape. Topics like nutrition, health, consumerism, environmental quality, transportation spring to mind immediately.

Learning how to decide is the ground where we can meet all of our students compelled to be with us. Not so that we may, by means of their willingness to engage in puzzle solving, sort them into categories, but to help them develop the range of knowledge which they can tap in decision making. And just as important provide a forum for learning how to do this. Learning how to decide is different from puzzle solving--and what is compelling about science is not its puzzle solving aspects, but that there is a lot in our everyday world related to science which we can discuss as we consider what the future ought to look like. Discussion, as a teaching method is going to be very important and will change from a rare event as science classrooms to a central aspect of method.

## Some Reservations

I do not think, however, that we should venture into this lightly. Our focus on discussion could easily degrade into a process of trading opinion--uninformed bull sessions aimed merely at making each other feel better. If this happens we are in trouble. I fear this view grows in popularity as an alternative to more critical activities. The trend to a group-grope approach to important issues is distressing. The other danger I see is the failure to lay adequate scientific frameworks for discussion. Systematic study of science is going to be needed to feed into the discussion process. Finally it should be emphasized that the focus is on the processes of decision making, not the decisions themselves. These will no doubt change as students become more aware of the complexity of life problems.

## Summary

I see in the future then, a core or compulsory science course not derived from the disciplines, but from what teachers and students come to decide are issues of mutual concern and interest. The curriculum is in a real sense negotiated, but by no means ill-disciplined. The arts of the practical, as Joseph Schwab (1970) never tires of pointing out, are difficult, but critical to social and moral life. Science as it bears on this social and moral life is critical and compelling. Students may simply lack vital information and perspectives if they are without it. And even more important, learning how to make decisions does not happen willy-nilly. It is a difficult thing to do. Teachers who are able to help students do this can feel they are helping students do what they must do in fact; that is, continuously make decisions of personal and moral policy.

My vision of the compelling curriculum is one that prepares people to participate morally in their society. It is not a curriculum where students must make large leaps between what they study in school to their world, nor postpone concerns, nor experience the rejection of their commonsense; but a place where they learn to make decisions vital to them and to all of us.

If we use science in its puzzle solving aspects to alienate those whose culture or background leads them to find puzzle solving difficult and thereby deny the potential of science to them, we are doing no good.

This is not to rule out systematic study of science within our compulsory curriculum. It is only to say that there must be a curricular focus whose values lie beyond the value of the discipline.

I began this by saying I was, in fact, following a tradition began about 120 years ago. Richard Dawes, (Layton, 1973), a contemporary William Whewell, was a clergyman with a bent for science education. As part of his work he established schools in his rectory. Dawes's views on education are interesting. His views on schooling for the working man are, in many respects, like those I am expressing here.

1. We should not use schools as instruments for moulding children into conformity with a culture imposed from above.
2. Find out what students consider vital and go from there.
3. Use knowledge to make pupils alive to the humanities of life, to make them feel what they owe to themselves and to those around them.
4. Scientific knowledge is to be applied to the understanding of familiar things.
5. Do not imagine you are preparing future practitioners.
6. Act on materials in an environment which provides opportunity for discussion not just mere transmission of information.

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# PARADIGMS FOR LITERARY STUDY IN THE 20TH CENTURY

Stephen Bonnycastle

In the first meeting in this series Professor John Coleman said that the real burden of what he had to say was contained in the second chapter of Science and the Modern World by Alfred North Whitehead. I agree with Professor Coleman's high praise of this book, but it occurred to me that no one who spoke authoritatively about studies in literature could refer, in the manner he did, to a book fifty years old. I take this as a sign that literature as a field of studies has changed much more in the twentieth century than mathematics, and indeed I suspect this is true. My aim in this paper is to describe the principal changes which have occurred in this century in the common, accepted ways of studying literature.

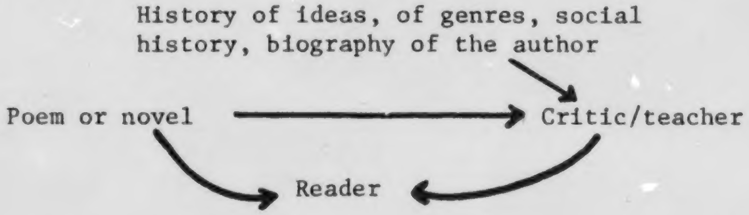
When I talk of literary studies I am not referring to creative writing, to what poets and novelists and dramatists do. I am referring to the activities of teachers, critics, editors, and most of all of readers (the consumers of literature)--all the activities which create and maintain the institution of literature. I think there is no doubt that this field is more like a jungle than a well-organized city where you are familiar with the streets and know how to get from A to B. I think most people who work with literature feel uncertain and bewildered much of the time. We suspect that our work might be devoured by some more powerful mind working with better tools, and wish there were some way of rising above the confusion, and seeing the overall pattern of activity. I am going to pretend that I can do this, to provide you with an imaginative map of what has been happening in this century. It will be rough, based on hunches, and a lot will be left out. Nevertheless my map can be modified and improved, and at least it will provide a starting-point for discussion. After presenting this sketch, I will show how it can be related to the curriculum in schools and universities, and I will conclude by trying to relate the sketch to the aims of integrative education.

## Paradigm A: Life and Times Criticism (see Figure A)

The first paradigm I associate with the nineteenth century, although the work done under this paradigm is still with us, and thriving. According to this paradigm, the reader reads literature, and the function of the teacher or the critic is to relate the work of literature to its historical background. The critic investigates the original context of the poem or novel, and helps the reader to enter into the circumstances in which the poem or novel was produced. Two different ideal goals are often proposed in this kind of criticism: the purpose is either to help the reader climb inside the mind and personality of the author, or to reconstruct the response of the contemporary audience. What matters is either what Shakespeare meant, or what his audience understood, by his plays. An eminent critic of this persuasion has said:

Figure A: Paradigm A: Life and Times Criticism

The subject to investigate is the original context of the poem or novel, the mind of the author, and the reception of the text by the contemporary audience. Sainte-Beuve was an eminent critic using this paradigm, and it is basic to scholarship in the history of literature.


History of ideas, of genres, social history, biography of the author
Poem or novel
Critic/teacher
Reader

> Literature, the literary product, is for me indistinguishable from the whole organization of the man. I can enjoy the work itself, but I find it difficult to judge this work without taking into account the man himself. . . . One has to ask oneself a certain number of questions about an author: . . . What did the author think about religion? In what way was he impressed by the contemplation of nature? How did he handle himself in the matter of women? Was he rich? Was he poor? And so on.
>
> (Sainte-Beuve, *Nouveaux lundis*)

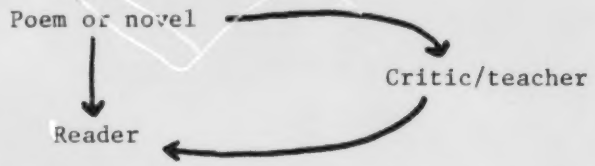
You can see how this paradigm of criticism is the appropriate one for the praising of artists, and usually the impulse behind the best work of this sort is an intense admiration of the author. This paradigm often leads to literary biography. What qualifies the critic (or the teacher) in this paradigm is his knowledge: he acquires pupils because other people want this knowledge, and they can get it from him.

### Paradigm B: Practical Criticism, American New Criticism (see Figure B)

Paradigm B can be dated a little more accurately. It was developed, as an influential educational model, in England in the 1920's by I.A. Richards, and in the 1940's and 1950's it became very important in North America as the basis for 'American New Criticism'. Richards' revolutionary move was to say that he was especially interested in the effect which poems had upon readers in the present time, rather than in the connexion between a poem and the past. 'Practical Criticism' was an exercise in which a reader was given an unidentified poem, and asked to read it carefully and write down his reactions to it. Bad poems were mixed up with good poems, ancient with modern; the important thing was the response of the reader. It is fair to say that in the 1950's and 60's, both in England and here, the reading of isolated texts became a standard teaching method. For myself, and for some contemporary students of English in the 1960's, it was an enormous intellectual liberation to feel that what was important was our responses to individual texts--we had decided to study literature because we were interested in our responses to poems and novels, and suddenly, there *we* were at the focal point. It was also a liberation from the dead hand of the past. There was an infinite amount of historical material to digest, it was hard to know where to begin, and the returns (at the beginning) were absurdly small. It did not help that teachers, teaching according to Paradigm A, expected you to know and be interested by what they knew--and it was clear to the students that occasionally this meant absorbing the

Figure B: Paradigm B (1920- ): Practical Criticism, American New Criticism

The subject to investigate is how the poem/novel affects us now. I.A. Richards and Cleanth Brooks are important critics who used this paradigm.



obsessions, if not imitating the neuroses, of the individual teachers. (This is not necessarily a criticism of the teachers, although it might be. As a teacher I find it difficult, but important, to distinguish between my own obsessions and what I think essential for my students to learn.) To say that what mattered in literary studies was there on the page, in the poem, made it possible for a student to stand on a roughly equal basis with the teacher. At the least it prevented a teacher from always being able to win an argument by dipping into his historical basket, which he had filled with much labour, and pulling out another (seemingly arbitrary) fact.

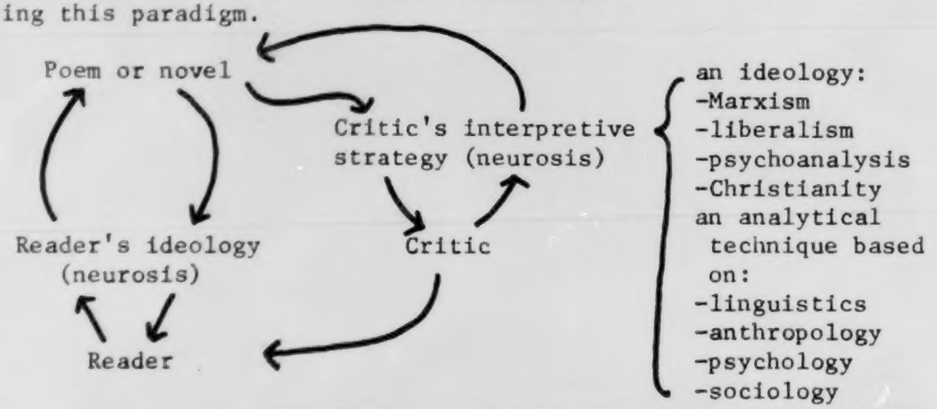
One justification for Paradigm B was provided by those critics who pointed out that it is almost impossible for us to really think the way the Elizabethans or the Victorians did. If climbing back into the past is impossible for the expert, how could it be a sensible aim of an undergraduate education? So the teachers and critics who adopted Paradigm B saw their particular skill as being that of an interpreter, who could point out things in the text which were interesting and significant, and the test of their skill was that the student would agree, and say, 'I didn't see it before but I do now' or 'I respond better now' or (in the best cases) 'this is much more interesting/fun/exciting'. Under Paradigm B the teacher is not a repository of knowledge, but a master of reading techniques. He is the person you seek out when you want to improve your reading powers, the way you would go to a piano teacher to improve your playing. And critics who provided books of practical criticism often compared their work to performances. A good essay on 'The Ancient Mariner' was like a good performance of an oboe concerto.

### Paradigm C: Structuralism, Hermeneutics, French New Criticism (see Figure C)

Paradigm C came into the spotlight in the 1960's, particularly in France, and since then it has aroused great interest in the United States, and some in Canada. 'French New Criticism' is a general term which was coined to defend the new movement in France against a conservative and aggressive professoriate. There was a violent intellectual confrontation in which *le structuralisme* became, if not a household word, at least a word frequently used in the French equivalents of The Economist and Time Magazine.

Figure C: Paradigm C (1960- ): French New Criticism: Structuralism and Hermeneutics

The subject to investigate is how an interpretive process works on a text to produce meaning. The critic looks out for (unconscious) ideologies at work. Roland Barthes, Tzvétan Todorov, and Gérard Genette are important critics using this paradigm.


Poem or novel
Critic's interpretive strategy (neurosis)
an ideology:
-Marxism
-liberalism
-psychoanalysis
-Christianity
an analytical technique based on:
-linguistics
-anthropology
-psychology
-sociology
Reader's ideology (neurosis)
Critic
Reader

Structuralism and hermeneutics are two kinds of French New Criticism, and I will distinguish between them in a moment. First I would like to make a few comments on what they have in common, as shown in the new paradigm. It is essentially a modification of Paradigm B. There were two main problems with Paradigm B, which became more and more apparent as it became more influential. One was that the various analyses of literary works seemed hopelessly isolated, like islands scattered in the sea before the discovery of navigation. Critics with intellectual ambitions hoped to build something larger, and this was a noble ambition. The second problem was that it seemed naive in Paradigm B to assume that the poem spoke directly to the critic or the reader. If this were so, why were there so many conflicting interpretations? The answer was that (according to Paradigm C) the reader did not simply read the poem, he interpreted it. He came to it with a set of beliefs, prejudices, a background of experience, and a technique of reading (however it was acquired). The arrows in Paradigm C move in a circle to emphasize what the reader (or the critic) brings to the reading. No doubt the structuralists and the hermeneuticists were encouraged by research in perception which suggested that we do not simply receive sensory data, we try to impose order on them. In a similar way the reader tries to impose patterns on the novel he reads, and the novel confirms those patterns or forces the reader to modify them. Most readers (we assume) do this unconsciously; the critic does it consciously; he is especially sensitive to the interpretative process, and he has a variety of methods of analysis at his disposal. He may be very versatile, and be able to produce at the drop of a hat a Christian interpretation of King Lear, or a Marxist interpretation, or a psychoanalytic interpretation; or he may be more limited, and specialize in one kind of interpretation. But according to Paradigm C there is always some interpretive process going on when a reader gets meaning out of a text, and it is a gross error to speak of any meaning as being 'natural' or self-evident or absolutely right.

Structuralism and hermeneutics are both five-dollar words, and I would like to try to distinguish between them as current trends in literary criticism. They are hard to pin down--no one in France, for instance, will admit to being a structuralist any more, except perhaps Lévi-Strauss, the anthropologist forefather of structuralism. This shifting of meanings and allegiances is the result of the intense interest which these two fields arouse in some literary communities. A literary structuralist, when studying a text, would say that its meaning is produced by certain systematic oppositions contained in the text, and his job as a teacher would be to uncover these basic oppositions. In 'The Waste Land', for instance, there is a significant opposition between the moments of vision, which are beautiful, and the dreary monotony of city life. Structuralists often use concepts borrowed from synchronic linguistics, a discipline developed by Saussure in the early years of this century, who said that language itself is built up out of a set of systematic oppositions. The aim of a literary structuralist would be to describe a text, or the work of an author, in terms of repeated structures. These descriptions, when they are interesting, penetrate to a deep level of the text, and often have the demystifying effect which psychoanalysis can have on a patient: they suggest that an author repeats himself over and over again, but manages to hide this from the audience and perhaps from himself. This is only one kind of project undertaken by structuralists--others have been attempts to define the various genres, and even narrative itself, in deductive, theoretical ways. Generally speaking, good structuralist writing has the feel of an incipient science: the structuralist is trying to discover patterns in the literature with which he is dealing, and he is concerned to verify them and build up a coherent theory of literature. His aim is similar to that which Freud announces at the beginning of his lecture on 'Anxiety and Instinctual Life': he wants to introduce 'the right abstract ideas, whose application to the raw material of observation will produce order and clarity in it'.

Hermeneutics, which has a long history in Biblical study, simply means the general science of interpretation, and it is often opposed to exegesis, which is the commentary on a particular passage which results from the application of the general method. Literary hermeneuticists today tend to emphasize the belief mentioned earlier that we are, all of us, all the time, interpreting, and therefore it is important to understand our interpretive processes. They take this to an extreme when they say that the work of art--the poem or the novel--has no real existence on the printed page; they would say that it exists only when it is read, and that it exists in the mind of the reader. This is the point at which they part company with the structuralists. The structuralists are looking, basically, for patterns in texts (which most people could agree on), while hermeneuticists tend to withdraw into the inviolability of the individual consciousness. When hermeneuticists write about literature, they sound more like artists than like scientists. If structuralists are obsessive, always looking for objective order, then hermeneuticists are hysterical, and insist on the importance of their innermost feelings. It has been said that the interesting problems are posed by hermeneuticists, and solved by structuralists. I think that is a good way of putting it. This shows the advantages of getting the obsessive and the hysterical elements in a group, or in your own mind, to work together.

## Progress from Paradigm A to Paradigm C

You may have gathered that I regard the shift from Paradigm A, through Paradigm B, to Paradigm C, as a progression from the darkness into the light. I would like to say briefly why this is so. Paradigm C seems an obvious improvement on Paradigm B: a new variable is introduced which helps enormously in analyzing the situation. But it is the shift from A to B, or from A to C, which needs defending. What is the justification for lopping history off from Literary studies? The most persuasive reasons can be found in The Theory of Literary Criticism: A Logical Analysis by John Ellis. For many years, he says, critics have been looking for a quintessential element which makes literature literature. But the search is a useless one, because literature is to be defined not in terms of inherent properties, but in terms of the use which society makes of certain texts. In other words, it is the readers (collectively) who make literature literature, and they do so because they find something interesting in these texts, even when they are cut off from their origins in history or the life of the author. So it is the participation of a text (written in 1601 or 1798 or 1860) in today's intellectual economy which is responsible for making it literature, and it is that participation which must be studied if we want to understand literature.

I find this theory attractive and persuasive, and it suggests a host of interesting questions to follow up. It also implies that literature has some social utility. But I should also say that I find something quite unattractive about Paradigm A, which makes me happy to leave it behind. This is essentially the tendency to hero-worship which it encourages. Now a large part of education in the humanities is a matter of cultivating heroes, and I agree with those who say that individual progress is often based on a passionate admiration of some figure--a hero, who may be an author or a teacher. But I do not think that this should be the ultimate goal of an education in the humanities. The reason can be found in Whitehead. The cult of personality leads to the glorification of inert ideas, and the submission of the present to the past; it is very similar to the process in which a child is stunted by a domineering parent or teacher. The progress from Paradigm A to Paradigm C looks to me like the progress from tyranny to democracy; the author as benevolent despot is being dethroned, and the consequent liberation of thousands of teachers, students, and readers seems full of promise.

## How does this pertain to curriculum?

How does this advancement from Paradigm A to Paradigm C pertain to the curriculum in schools and universities? I think that most people who acquire some interest in literature in their school years are operating with Paradigm B--they read a book, and they become interested in it. But when the student comes to university, things change. The staffing of university departments, and the organization of university courses, is almost always based on historical periods. The chairman hires a specialist in the 18th century because the department has a 'gap' there, and 'good' departments offer courses which cover the historical range of English, Canadian, and American literature. The result of all this is that when an interested student begins studying literature at a university, he almost always moves from Paradigm B to Paradigm A. This seems to me, to put it baldly, a step backwards. It does not advance the cause of literature, and it is, I believe, anti-intellectual, because it obscures the most important literary problems, and substitutes historical problems. English departments ought to be organized according to Paradigm C. But this would involve major changes in staffing and in thinking. Whether or not to embark on these changes poses the interesting problem of whether it is better to have a tight organization (according to historical periods) which is structurally unrelated to the subject being taught, or a loose organization which might move toward a structure which is more nearly related to the subject. Most people's answers to this question are closely correlated to their political views, and to the amount they have invested in the present system. The actual details of a new method of organization have yet to be worked out. This is one of the challenges which Paradigm C presents.

## How does this pertain to Integrative Education?

What is the outlook of a student of literature on Integrative Education? What attitudes do we take toward other disciplines? Are we friendly, or hostile? Are we seeking allies or enemies? The field of literature looks like a good ground for bringing several disciplines together. In Paradigm C, and particularly in structuralism, there is a strong sense that the study of literature is one of the social sciences, and, as a newcomer, it has much to learn from those which are better established. The analysis of ideology, or of interpretive strategy, or of neurosis, profits from the use of tools developed in other disciplines, and it is hard to see how the description of the reception of literary texts can be anything but a province of sociology. I think it is true that many of the most eminent writers-about-literature are well qualified in neighbouring fields. So although some of us are prickly, on the whole we are quite a friendly group, and we have our ambassadors out and working in other fields.

I should mention one attitude, well expressed by Northrop Frye, because it is stimulating, but also because it is imperialistic and perhaps dangerous. Frye suggests, at the end of Anatomy of Criticism, that literature is related to the social sciences in the same way that mathematics is related to the sciences. He says that social sciences are built on verbal structures--on sentences, and, at a different level on myths--and that the literary specialist is best equipped to analyze these basic components in the social sciences, and show how they may be influencing minds, directing research, and even determining results. This matter is an open one and cries out for further study.

Many teachers of literature would be attracted by Integrative Education, because their subject leads them to cross traditional boundaries between disciplines. I agree with Professor Coleman that the strongest impulse toward interdisciplinary work does not come from a feeling that we should have courses on literature and sociology, or literary anthropology. The real incentive to work with thinkers from different fields comes from the desire to solve a problem. If you really want to solve a problem, the boundaries between disicplines cease to have much meaning; and when you have found the solution, you naturally hope that it will be of interest not just to your colleagues in literary studies, but to your friends who are working in other fields.

## Bibliography

Raymond Williams, 'The English language and the English Tripos', Times Literary Supplement, 15th November, 1974, pp. 1293-4.

This is a short history of the changes in the Cambridge English program from 1900 to the present, showing the ideological implications of these developments (e.g. of abandoning the study of grammar, or of studying Greek and Latin literature in translation rather than Anglo-Saxon). Williams believes that the isolated readings of great works fostered under Paradigm B needs to be integrated into a larger scheme; he suggests that this might be achieved through the study of language (synchronic linguistics and contemporary developments in linguistics, not a return to Anglo-Saxon). He is strongly opposed to studying only the 'great works'; he wants literary study to deal with the whole body and practice of speech and writing.

John M. Ellis, The theory of literary criticism: A logical analysis. (University of California Press, 1974.)

This I think is an excellent book: short, clear, persuasive, and innovative. His revolutionary suggestion is that to relate works of literature to their original context is not to treat them as literature at all, since 'literature' is an institution created by an audience, and for a work to be admitted to that institution (many are offered, and few are chosen) it must be interesting and have significant meaning, without needing to be referred to its immediate context or origin. The relevant context of a literary work, he says, is the community which uses it as literature--that is, us, now.

Northrop Frye, Anatomy of criticism, the 'Polemical introduction' and the 'Tentative conclusion' (Princeton University Press, 1957).

In these forty-five pages Frye defends his belief that the study of literature should be systematic and progressing, and based on the whole of literature. At present, he says, criticism is in a state of naive induction, and is like a primitive science. Criticism begins, he says, with the text which is studied, and progresses toward an apprehension of the structure of literature as total form. His position is informed by his belief that imaginative literature helps us to imagine and to develop the ideal society, which would be 'free, classless, and urbane'. He concludes with a comparison between mathematics and language, suggesting that both begin as ways of describing the world; they subsequently develop inner structures independently of the world; and then succeed in increasing our understanding of the world by projecting these developed structures back on the world. As Oscar Wilde said, life imitates art. Cf. Plato: 'God is always doing geometry.'

Jonathon Culler, Structuralist poetics. (London: Routledge and Kegan Paul, 1975.)

This is the best book in English on structuralism, as far as I know. It gives a good account of the linguistic foundation of structuralism. For a briefer introduction, see his article in the New Review, entitled 'Modernism: Linguistics' (Vol.1, No.10, January 1975, pp. 13-18).

Roland Barthes, *Critique et vérité*. (Paris: Seuil, 1966.)

This eighty-page pamphlet by the most eminent and stimulating literary structuralist is a polemical defence of French New Criticism, in response to a vituperative attack called *Nouvelle critique ou nouvelle imposture?*, written by a historical critic at the Sorbonne. Many of Barthes's other books have been translated into English; this has not.

This is a guess on my part, but I think that the developments in literary theory over the next ten years can be best followed in these three periodicals: Critical Inquiry, published by the University of Chicago, New Literary History, and *Poétique*, edited in Paris by Tzvetan Todorov and Gérard Genette, two of the leading members of the second generation of structuralists.

# LITERATURE IN THE SCHOOLS:
# ITS NATURE, ROLES, AND FUTURE

Ron B. Turner

The role of literature in the schools, as it is in essence everywhere, is consciousness raising. As defined by school curriculum subject guides, literature is a sub-set of language study and has been umbrellad even further in school curriculum structure under the heading of Communications Arts, as per HS1, 1971. I feel comfortable with all of these categorizations, though there are current protestations that such broad category spectra are part of a *laissez-faire* waffling in curriculum design against which the back-to-basics movement is so opposed, with its assumption of the loss of hard core curricula. (Certainly, the notion that typing, as a communications skill, is a communication study analogous to that of literature does seem a bit mistaken.)

Literature has always been considered a specialized use of language, a language sub-set. Changing attitudes toward the concept of language are forcing changes of attitude toward to concept of literature: literature is now coming under the examination of linguistics (rather than of traditional grammar and rhetoric), a branch of semiotics, in turn a branch of (social) psychology. In English classes, then, the impetus is to look at ways in which language structures are manifestations of various psychological realities.

It leads, for instance, to the examination of language in the context of communications models. Here, one does not consider points of grammar or style in the abstract, but rather as part of a "communications context" in which the "encoder" must make a series of communcations decisions on the basis of his analysis of the context, and where the "decoder" may attempt to analyse these decisions. Since the appropriateness of the encoder's language choices resides wholly with the context at hand, there is a vast range of potentially appropriate language levels and usage; one may not assert a pure standard of "correct" usage to be studied to the exclusion of all others. There is, of course, an appropriate style for the writing of essays and for other academic contexts.

A Simple Communications Model

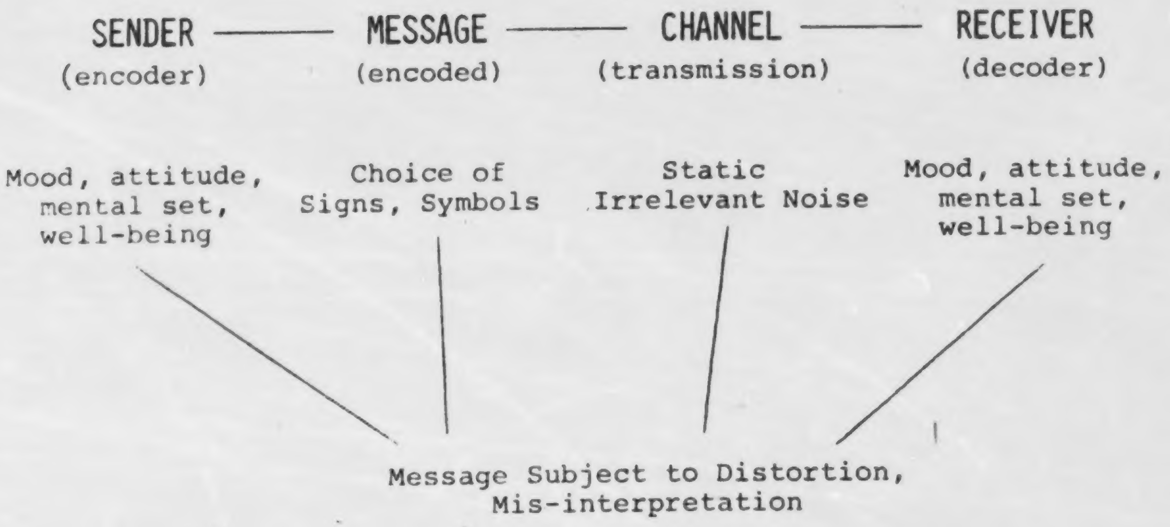

SENDER
(encoder)
MESSAGE
(encoded)
CHANNEL
(transmission)
RECEIVER
(decoder)
Mood, attitude, mental set, well-being
Choice of Signs, Symbols
Static Irrelevant Noise
Mood, attitude, mental set, well-being
Message Subject to Distortion, Mis-interpretation

Figure 1.

This simple model is useful as a grid to examine both students' own language use and that of traditional literature course materials. It is also an assimilation model which permits congruent examination of all media forms--film, advertising modes, etc.--and vastly expands the corpus of potential "literature" under the general cognomen of "semiotics." Actually, it is probably more important today to study the language of politicians and admen than it is to study the works of the traditional literary masters. Roland Barthes (Scholes, 1975) distinguishes between the literature which is "readable" in our time--the classic--and that which is "writeable" in our time. That which is writeable in our time is indispensable to our understanding of the world; the classic, which contains the codes of the past may be useful but is secondary and potentially misleading. The demand for relevance in our schools (a concern I will not dismiss as merely a "campy" slogan of late 1960's sentimentalists) can have no more insistent assertion than this.

The most valuable implication of this shift in attitude toward language study is the hopeful insistence that the language studied by the student in the classroom will be psychologically real to him. Such insistence is a dangerous threat to many traditional schoolroom practices. The failure of schools to inculcate literacy is primarily a failure to make the value of literacy a psychological reality for their students. The formalist approaches to language study, figured by the rule--example patterns of traditional grammar and rhetoric fail for this very reason. Until the student feels the reality of the participle along his blood and grapples the metaphor to his soul with hoops of steel, all the rote iteration of rules and hypothetical examples will do him no good. The value of the communications model is that it invites the student to participate in the dynamics of language utterance, to become a tester and evaluator of information circuitry, and, of course, of the circuitry of his own head. When a student enters the language classroom, he should enter, not the shrine, but the laboratory.

A specific instance of such strategy is to be found in the work of Kenneth Koch, an educator in the New York City school system, whose most recent book, Rose, Where Did You Get That Red?: Teaching Great Poetry to Children (1974), summarizes his method and gives many instances of his results. In brief, Koch gives the students (ranging grades 4 to 6) what he conceives to be the "communication situation" in great works of poetry and asks students, before they look at the actual work, to write their own language responses in that communication situation. This, in approaching "The Tyger" by William Blake, Koch will direct the students to "write a poem in which you are talking to a beautiful and mysterious creature and you can ask it anything you want--anything. You have the power to do this because you can speak its secret language. Yes, the creature may speak to you" (p. 36). Here is a sample result:

Monkey

Oh, you must come from a hairy god.
Where do you get your funny voice?
Monkey, where did you learn to climb?
Monkey, how did you live to eat bananas?
Your feet must come from a chicken farm.

Michelle Woods (p. 38)

While the student may not always enter the communications paradigm in this dramatic and immediate way, nonetheless it remains the focus for him to explore the patterns in language as aspects of the model. There are a number of fine language study texts based on linguistic principles of investigation now available, with titles such as Language Is!, Language Moves, English Everywhere: Meaning, Media, and You, to companion--and, hopefully, somewhat displace--the traditional grammar rule books. These books have chapter titles such as "How Symbols Work," "Ding-Dong and Bow-Wow: Theories of Language Origin," and "Discovering the Movies."

One may take pure linguistics paradigms such as Joos's diagram of "Language Styles" (Wilkinson, 1971) and use them as direct analytic tools for works of literature. For instance, at what level do the verbal exchanges between various characters in a novel occur? Are these registers useful in analysing the relationships among the characters? In turn, again, this awareness of language levels has direct application to the students' own speaking and writing idioms.

### Language Styles

The work of Joos (1961) draws our attention to certain aspects of the Addressor-Addressee relationship; how, for instance, the age, 'gentility', and 'sense of responsibility' of the participants affect the language. In particular, he writes of five 'styles' of language; that is to say how the language takes into account the closeness or distance between the participants:

Frozen. A style for writing. It is frozen in the sense that it is not subject to change by interaction with the Addressee, and so permanent--it may become 'literature'.

Formal. A style of pre-involvement, a style in which, for instance, introductions take place. It has formal phrases ('May I introduce. . .') in which the Addressor is not committing himself to more than a distant relationship.

Consultative. The style for coming to terms with strangers. The Addressor supplies background information--not assuming he will be understood without it; and the Addressee participates continuously. This the norm for most conversations.

Casual. Insiders, people within a particular social group--friends, colleagues, acquaintances--don't have to supply information to one another in the way they do to strangers. The casual style is marked by ellipsis (omission) of words, syllables. 'Can I help you?' is consultative. 'C'n I help you?' is casual. It is also marked by slang.

Intimate. Usually between two people, between whom so much information is shared that what Joos called 'jargon' is used (i.e. words with a special meaning for the two) and parts of sentences only may be employed, what he calls 'Extraction' (e.g. 'Ready?' for 'Are you ready?' In this pronunciation of 'Ready?' even the question intonation may have disappeared also).

Figure 2.

Note that in the light of these procedures the definition of literacy becomes the ability to encode and decode messages and the ability to select and apply appropriate usage levels.

Now I wish to return to my initial comment that the role of literature in the schools is consciousness-raising. Let me confess to a romanticism to begin with: for if prominent psychologists confess to the mystery of the connection between language and thought, I scarcely presume to have resolved it. However, I do have my favourite metaphors.

In the beginning was the Word, so says one of the ancient books of our western cultural tradition, and the Word became Flesh and dwelt among us. Whatever status one wishes to give to the notion of supreme Logos, my central interest in the paradigm is the observation that it is insofar as "word" becomes "flesh" that "god" becomes "man": and, in the dynamics of the same equation, it is as "flesh" becomes "word" that man aspires to the supreme condition of godhead or total awareness. It seems to me that all language is the struggle of "flesh" to become "word." Studies of language development in children reveal interesting phenomena. In the early stages of mental development, a child may associate the very existence of an object, say a toy, with a configuration of the musculature of his body, such that should a bright red object have been in his hand a moment before, that object, in infant logic, should reappear if the child repeats the configuration of his arm. Only by a long reiterative process will the child eventually infer the structure and principles of an autonomous world beyond his own flesh. The discovery of the concept of signs is surely one of the greatest steps in this development of consciousness.

The discovery of the power of the word as sign has rarely been so dramatically portrayed as in the climactic scene of The Miracle Worker, the biographical play of the early educative years of Helen Keller, at the moment when, accidentally, as she works the yard-pump handle in a frenzy of frustration, the young deaf and blind child associates the gushing water of the well with the sign-language cipher for water, when she discovers the concept of sign, when she suddenly has click into place in her head the knowledge that she possesses, in what seemed till then a set of meaningless configurations, the keys to the kingdom of language; that she stood on the threshold of a conceptual world. Having found the "right" word is always at least in part this celebration of the capacity of the human mind to grasp the concept of signs.

My central metaphor, though concerning the role of the word in personal consciousness, especially in those moments when one senses that one has found the "right" word, is a metaphor equally religious in origin and is James Joyce's term, used in the Joycean sense: epiphany (1956). Signs are epiphanies, points of awareness in the individual psyche. A word is a way of seeing--the dove of order descending upon the chaos of experience. A sign is a reference point in consciousness, a perceived point of tension between self and other, and also a kind of monstrance through the architecture of which one may see potential further meaning. But these are deep waters, and I am going back to the shallow end of the pool with my simple definition that a word is a way of seeing.

John McInnis (The Ontario Institute for Studies in Education psychologist)(1969), cites the example of a child who on a country outing chose the sign "cow" to represent his perception of bright sunlight, morning, clear air, birds singing--and used the word with this meaning the next morning when he woke up at home. That sign, however arbitrarily chosen, became the reference point for the child's epiphany or way of seeing. In Portrait of the Artist as a Young Man (Joyce, 1917) is traced the development of a human consciousness through hierarchical sequences of such epiphanies in ever more convoluted and complex verbal structures. Each chapter represents the expansion of Stephen Daedalus' consciousness figured as a riddle or labyrinth from which he cannot escape until increasingly complex acts of cognition (or epiphanies) release him. This portrait is interestingly analogous to Jean Piaget's speculative description of the role of mental categories and memory codes in the growth of individual awareness (Steiner, 1971):

> The child's action transforms reality at the same time that he is also triggered or transformed by it. The organism imposes a 'schema' on the surrounding world. As it develops, as its relations to the environment become more intricate and creative, that 'schema' is modified. Thus the fascinating hypothesis that our memory code, far from being fixed and essentially automatic (like a computer), is itself in a constant process of restructuring. We "repack" the past for out needs as we travel ahead.

The function of language in this epiphanic sense should be the central concern of the language classroom and the implications for methodology which follow from it are fairly clear. Students must be brought into a creative relationship with language; they must experience the epiphanic vitality of language in a way which is psychologically real for them.

Consider, for instance, the concept of "key words." This concept may be used to gain an understanding either of literature texts or of oneself. A linguistic strategy for analysing literary texts is the isolation of the so-called "lexical pillars" which shore up the central vision of the text. William Golding (1966 broadcast) talks about the poem that lies at the heart of any novel. Similarly, a student may come to terms with himself by attempting to isolate over a series of writing experiences his own "key words" which he customarily uses to define his attitudes toward the world and himself. Benedetto Croce, the aesthetics philosopher, says that if we cannot manage our own awareness with a set of signs, that awareness is likely vague, ill-formed, and unavailable even for our own thinking. The more one sees, the more one is: ways of seeing are ways of being. George Steiner, in Extraterritorial (1971) says this of metaphor: "the verbal and the neuro-physiological seem to touch closely"; there is a "new arc of perceptive energy." I create the world by naming it, and I create myself as well.

The teacher's role in this evolution of consciousness is to create tasks which may be described as "language events." The student's participation in language events should bring him to more comprehensive ways of seeing. Marshall McLuhan (1971) talks about the information crisis in schools and in society. The critical condition is information overload. What we make students do with information is the number one crisis in schooling. McLuhan's urging--and do we need him to prompt us?--is that we must get out of the trap of having students simply store away information. In McLuhan's terms, the student needs experience, not in data classification, but in pattern recognition. In the "language event," the student is required to recognize and participate in pattern. My humble term for a specific pattern (my lofty, metaphoric one was epiphany) is a "frame". The student will use "frames" ot investigate language. The Joos hierarchy previously referred to, or any analytic linguistic tool, is a "frame". Any traditional literary critical perspective is a "frame", for instance, the trope of irony--although there is an invitation to think of more complex frames, such as Frye's concept of Identity and Alienation in literature (1963,a). Any theory or principle from any art or science is a "frame". How is one to deal with James Joyce without getting involved with the archetypal patterns of C.G. Jung (1971)? How is one to deal with Expressionism in literature without inviting parallel perspectives from painting and music? As well as this kind of framing, there is what Marshall McLuhan (1964) invites us to perceive--through the technique of "media-transfer"--the structural principles of any given medium of communication, the awareness that each medium, or "channel" in terms of a communications model, has its own way of structuring or framing reality. As one transfers the message of a novel to a film, for instance, one acquires an "X-ray" of the medium itself: one becomes increasingly aware of the way in which any one medium distorts the message which it tries to convey. One discovers, as well, that certain media prefer certain contents. The article, "Why Write It, If You Can't Sell It to Pictures?" by Budd Schulberg (1963), is an interesting example of this kind of analysis. Teaching reading skills is as much as anything reaching students about these frames through their participatory analysis of them. We are teaching how literature works, how genres work, how individual stylists work. The crucial element in understanding T.S. Eliot is knowing how Eliot's style works. I have seen fatal experiences in which teachers tried to teach Eliot by way of content summary, when what was needed was a sense of pattern or structure. John Ciardi (1959) is right when he titles a book on poetry analysis, not What. . . , but How Does a Poem Mean? Linguistic strategies insist on pattern as a dynamic process which can be investigated in operation and tested for results.

To speak briefly of futures. The field of literature, in opening itself up to dynamic methods of investigation and inquiry, confesses to a disturbingly new concept in literary criticism--that genre and other structural categories are open-ended and that literary forms will change as contemporary consciousness changes. As we pursue the study of language as a way of knowing, we encourage the student to live in a world of open rather than closed forms, in a world of multiple yet coherent perspective.

"What is English?" asked the Dartmouth Conference of American, British, and Canadian Educators in 1966. The answer to the question was that "English is what English teachers do." Three camps of English teachers, and what they do, have been identified as follows (Kitzaber, 1972): (a) sustainers of the "Cultural Heritage", (b) advocates of "Personal Growth", and (c) "Life Adjustment" specialists (mainly inner-city workers in the United States). Beyond the concerns of any of these camps, whose claims are valid in their own way, there is a need for schools to be open to new teaching ideologies based on structuralist/linguistic principles, a need to incorporate new forms of awareness, electronic media such as film, and new fictional modes such as science fiction, into the curriculum.

Meantime, voices are crying "back to the basics." Whatever this phrase means, I hope that it does not mean (though I fear that it does) back to nineteenth-century grammar practices and nineteenth-century novels. There is a simplistic vision in the back-to-the-basics mentality which seems compatible with current economic anxieties. School systems have old grammar books and novels, and cannot afford to buy new ones. Local libraries--it is sadly amusing to note--which may or may not have William Golding's Lord of the Flies on their shelves, do have Ballantyne's 1858 novel, Coral Island, of which it is a parody.

The crisis in schooling is merely part of a larger cultural crisis, one which I will term a crisis of perception. Shelley (1840) spoke of the role of poets to vivify language and cultural vision: Christ must be born again in every age. What are the appropriate modes for expressing twentieth-century awareness? Are they to be found in the so-called "New Science Fiction", the exploration of inner space? In his novels, the characters of J.G. Ballard (1972) are not characters at all in any traditional sense; they are hierarchical spheres of awareness. Ballard discussed his characters in a radio interview with George Macbeth on the BBC Third Programme:

> Macbeth: I think this element of layers also comes out in the density of some of the stories--the way you seem to link together references from a wide variety of fields. I quote if I may, as an interesting example, one passage from "You and Me and the Continuum", which is the kind of passage that recurs in a number of these stories:
> Kodachrome. Captain Kirby. M14 studied the prints. They showed: (1) a thick-set man in an Air Force jacket, unshaven face half-hidden by the dented hat peak; (2) a transverse section through the spinal level T-12; (3) a crayon

> self-portrait by David Feary, seven-year-old schizophrenic at the Belmont Asylum, Sutton; (4) radio-spectra from the quasar CTA 102; (5) an antero-posterior radiograph of a skull, estimated capacity 1,500 cc.; (6) spectroheliogram of the sun taken with the K line of calcium; (7) left and right hand-prints showing massive scarring between second and third metacarpal bones. To Dr. Nathan he said: 'And all these make up one picture?'
>
> Ballard: Exactly, they make up a composite portrait of this man's identity. In this story I was examining the particular role that a twentieth-century Messiah might take, in the context of mid-twentieth-century life, and I feel that he would reappear in a whole series of aspects and relationships, touching an enormous range of events, that he wouldn't have a single identity, in the sense that Jesus had--he would have a whole multiplex of contacts with various points.

Could Shelley have envisaged this coming of Christ in our age? In the work of John Fowles (1969) we see the evolution of the twentieth-century novelist, who, in mid-plot of The French Lieutenant's Woman, abandons the omniscience of the nineteenth-century writer and becomes a character in his own story. For a number of reasons, the novel seems not to be a very useful contemporary form. Its ingenuity was taxed to the extreme by James Joyce and probably, in the end, the form failed him.

This artistic crisis is reinforced by an unprecedented selling out of the creative mind. Much high-powered creative energy has been harnessed to Madison Avenue. Prostitutes of the imagination dance in the guise of little sprites around our cereal bowls or as *belles-dames-sans-merci* seduce us into the front seats of new cars. An unholy alliance of psychologists and ad-men has bartered our souls for a pot of commercial message. Such real poetry as there is in an age which Steiner (1971, pp. 163-164) calls an era of semi-literacy and political oppression "is either poetry of deepening and remote privacy" or "megaphone poetry--the rhetoric of fantastication represented by a Ginsberg."

Basic illiteracy itself is likely to greatest immediate threat to our cultural survival. Certain patterns of radical antisocial behaviour seem clearly related to verbal inadequacy (Steiner, p. 88) to the inability of certain individuals to participate in society with any degree of verbal sophistication. The trauma of a teenager given an old car as a free gift comes to mind: unable to cope with the licence and insurance forms, and failing in an attempt to avoid them by claiming instead that he bought the car for a dollar, he shook his head and stormed out of the licence bureau muttering a string of curses.

Perhaps the great failure of our time has been the failure of corporate mythology. The anthropologist Margaret Mead talks about the absence of sustaining ritual in our society. There is a paradigm which suggests that, when the central mythology of a culture fails to align with the realities which confront it, the culture collapses. McLuhan (1971) talks about the problems produced by electric circuitry in the "over-retrieval" of the past and a subsequent loss of religious mystery--contemporary consciousness is a junk pile of old mythologies. Where is the true creative centre? Does the contemporary Canadian have a sustaining mythology, what Northrop Frye (1963, b) would call a "fable of identity", apart from one he can buy at the store? There is some evidence of emerging myth in Canadian writers, a mythology which evolves through redefinition of relationships with nature and native peoples (Jones, 1976). Marion Engel's novel Bear (1976), recent winner of the Governor-General's award for English-Canadian fiction, is an interesting example of this trend.

Dean Sinclair, speaking at the science symposium of this series a week ago, suggested that through scientific knowledge "we have dispelled the bogeys of the past"; yet, man is perforce a symbolic animal, whose world is forever charmed with mythopoeic life, as the studies of Carl Jung (1971) and Eric Berne (1973) show. There will always be strange creatures in the purview of man, and we need coherent mythologies to exorcise and contain them. Consider Jay Macpherson's poetic work "The Boatman" (1957) in which she conceives of man as an Ark: the function of poetry is "to get the beasts outside him" (p. 48). R.G. Collingwood (1955) proclaims that the poet "[must tell] his audience, at the risk of their displeasure, the secrets of their own hearts" (p. 336).

Schools must demonstrate to students that, through language, they may enter a coherent imaginative universe; and schools must approach the study of language in such a way that, more than a craft, language becomes the agent of the conscious life, and a tool to unlock the resources of the culture.

The wider view of "language" as descriptive of any medium of communication affords the opportunity to gain perspective of all expressive forms, and of the condition of the human spirit in the twentieth century. The realization that montage was a stylistic technique used simultaneously in the 1920's by Eisenstein, D.W. Griffith, Charlie Chaplin, and T.S. Eliot is a key to understanding all of them, and argues more for the coherence and integration of all media forms than for their study in isolation. Beyond such comparisons, lie the super-categories which reach from literature and film to music and sculpture and painting. It is our struggle to be artists and to see what artists see. More precisely, we must evolve citizens whose perceptions are heightened and whose capacity to gaze on the future is not hampered by limited perspective. In other words, we must produce what may be described as good readers, students who understand the methods and power of the languages which can affect them, and who can articulate those languages in positive and creative directions.

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# PHILOSOPHICAL THINKING IN AND ABOUT EDUCATION: ITS NATURE AND ITS ROLE

S. Hills

> *If we are willing to conceive education as the process of forming fundamental dispositions, intellectual and emotional, towards nature and fellow man, philosophy may even be defined as the general theory of education.*
>
> John Dewey

To be invited, as have those of us participating in this series of symposia, to say something concerning a topic as broad and challenging as the nature and role of one's discipline is to be confronted with a difficult task. In putting a paper of this sort together, I find myself having to combat at least three separate tendencies; tendencies which threaten, at every turn, to lead one away from the major purposes that lie behind our coming together in order to discuss the possibilities for achieving some sort of integration among the various disciplines represented here. The first is an inclination to eulogize. The danger here, of course, is that the loftier the terms one uses, the less likely one is to say something that is intelligible, informative, or even true. The second is a tendency to sample, exhaustively or otherwise, recent work done in the field. The trouble with this approach is that it often reveals little more about the discipline than the peculiar policies and procedures employed by a particular group of scholars working in but one small area of the larger discipline. Thirdly, and closely related to the second, there is the temptation to assume that the goals and interests of those involved in one's own specialism are a genuine reflection of the goals and interests of all those working in the field, or, worse still, of all those doing the "best" work in the field. Here, once again, the matter of providing an undistorted account is problematic. While I have tried, as far as possible in writing this paper, to resist these temptations, I am not at all persuaded that I have been even moderately successful in this regard. In any case, these factors do help to explain, at least in part, why a task of this scope is a difficult one.

Bearing these difficulties in mind, I want first to give an account of the nature of contemporary philosophical inquiry into education which is meant to reflect something of the very considerable diversity to be found within this sphere. I will begin this part of the paper by considering two popular misconceptions concerning the philosophy of education, before moving on to offer a more positive picture of what philosophers of education, whatever their particular allegiances within the discipline (i.e. "analysis," "existentialism," "phenomenology," etc.) actually do. In the second part of the paper, in characterizing the role of the philosopher of education, I will succumb to the third temptation and attempt to say something about the contributions that philosophers and philosophy can make to education by concentrating, for the most part, on those areas with which I happen to be most familiar. Yet having said this I would want to emphasize the point that, in taking this tack, I am in no way suggesting that these are the areas which are the most productive or even the most promising within the field.

## I

One frequently finds that, when faced with the question of what is the nature of X, is that it is considerably less difficult to say what X is not than to say with the same sort of confidence what it is. And so it is with the philosophy of education. For this reason I will begin my attempt to say something positive about the nature and role of philosophy of education by first attempting to dispose of a number of misconceptions concerning these matters.

It is not at all uncommon, in conversations with educators, to encounter talk about "my philosophy of administration" or "my philosophy of testing or marking" or "my philosophy of lecturing or of lunch-room management." Here the "philosophy" has to do with some fairly specific activity; an activity assumed to be connected in some way with the educational enterprise. On other occasions, speaking in somewhat more general terms, teachers will sometimes say things like "my philosophy of teaching is--begin with the concrete and gradually move towards the abstract" or "my philosphy of discipline is--'never smile 'til Christmas'" or "my philosophy of pupil-teacher relationships is--be friendly but not familiar." And on still other occasions, usually those on which sentiment is permitted free rein, such as during an after-dinner speech, teachers are often moved to proclaim that their educational philosophies are "significantly" encapsulated in such slogans as 'I teach the whole child,' 'Education is concerned with developing the total potential of the person,' or 'I teach students, not subject matter.' But the efforts of two elementary teachers represent two of the most fanciful attempts to express a philosophy of education of which I am aware. The first did so by singing a little song entitled "Let's all get together." The second gave vent to his "philosophical" intuitions concerning education by creating a series of mobiles that were subsequently suspended from the ceiling of the classroom in which he taught.

While these illustrations differ from one another in certain obvious respects, they nevertheless do exhibit some interesting and important similarities. To begin with, when it is used in these sorts of circumstances, 'philosophy' or 'a philosophy' seems to connote something like 'my policy' or, perhaps better, 'my prejudice'. Indeed, when they speak of 'MY philosophy of education' there is a strong suggestion that people are referring to their own peculiar outlook on, attitudes toward, or beliefs about, education. Furthermore, and more importantly for my purposes, such talk also seems to imply that these attitudes or beliefs are relatively impervious to any form of critical scrutiny. In these contexts, in other words, to have a philosphy of education is tantamount to having a set of purely personal convictions or sentiments concerning various features of the educational enterprise.

Now, whereas this first misconception, implicit in the examples considered above, holds that a philosophy of education is merely a collection of beliefs or conviction, perhaps together with a certain attitude towards those beliefs, there is a second and equally popular misconception, of much more recent vintage, which tends to dwell upon certain aspects of a philosopher's methodology. Put in its crudest form, this is the notion that philosophy of education is nothing more than an activity which studies the words and other expressions used by educators. Both misconceptions not only persist but enjoy considerable currency--even today, because each of them contains an element of truth. The first is right, it seems to me, in assuming that a philosophy of education in some way involves having a particular sort of attitude towards and a set of beliefs about teaching, learning, the curriculum, and so on. Nevertheless, it is fundamentally in error owing to the fact that it radically misconceives the kind of attitude and the sorts of belief that are the life's blood of philosophy of education. That is, on this way of looking at it, a philosophy of education is a product to be "taken on" like some sort of cargo, or a new suit of clothes, and forever after left intact. And this, as I shall point out later, is mistaken.

The second conception of philosophy of education, philosophy as "word-mongering" or "linguistic trick-cycling" is likewise correct in its recognition that, for many philosophers, especially in the twentieth century, the activity of doing philosophy and the study of language have been and continue to be vital concerns. But, as I have already indicated, this way of conceiving of the task of the philosophy of education is also seriously misleading. And it is so for a number of reasons. To begin with, it is wrong in its simple-minded identification of language with words or other linguistic expressions. The philosphical study of the language of education is concerned with much more than the words which happen to figure prominently in the vocabulary of educators. Moreover, this conception is deficient in another important respect. In particular, because it seems to take for granted that the purpose of this kind of activity is transparent or crystal clear to all, or, alternatively, that linguistic trick-cycling is, of itself, intrinsically worthwhile or self-justifying. (Like Latin, or military training, it might be supposed, it disciplines the mind or builds character.) The difficulty with this notion is that it misunderstands and misrepresents the sort of reasons there are for engaging in an examination of educational discourse; reasons which, if made clearer, as I shall attempt to do in a moment, would help to show how this particular approach to the philosophy of education, properly understood, can be located squarely in the centre of a very long tradition of philosophical inquiry.

Now if one wished one could easily unearth and attempt to exorcise a number of other misconceptions concerning the job of the philosopher of education, e.g. the philosopher as swami having privileged access to the realm of educational values and cosmic objectives, and so on. Nevertheless. I shall suppress this impulse since for my purposes any such "search and destroy" mission is very much beside the point. My aim here has simply been to dispose of some of the more prominent and persistent of these bogeys in order to clear the way for a more positive picture of what it is that the philosophy of education is all about. It is to this task that I now turn.

In what follows I do not presume to be capable of succeeding in a job at which all others before me have to a greater or lesser extent failed; namely, that of providing an unambiguous, accurate, and broadly acceptable characterization of philosophy in general or of the philosophy of education in particular. My ambitions, however, are far more modest. I should merely like to draw attention to what I take to be important, though generally neglected, commonalities to be found among the very diverse projects upon which philosophers, over the centuries, have embarked.

To begin with I propose to look at philosophy, not as a static body of knowledge, but rather as a dynamic human activity, or form of inquiry. To view philosophy in this light is very instructive. For when it is seen in this way (not as a finished product--e.g. as something to be taken on, like a cargo, or possessed like a new suit of clothes), viz., stressing that philosophical inquiry is an activity, something one does, we can then set about the business of distinguishing it from other human activities by considering the special sorts of purposes it pursues and the manner and means by which it pursues them. From this perspective it can very plausibly be maintained that a good many philosophers, both historically and in the present day, are united in attempting to develop clear, coherent and comprehensive pictures of (or set(s) of beliefs concerning) the world in which we live and of our relation to it. Of course, the points at which they lay on the first brush stroke, the technique and materials they employ, and the meaning they ultimately convey often differ dramatically--hence the talk about schools of philosophy somewhat akin to talk of styles of painting. Nevertheless, and in spite of some pretty far-reaching differences, there has seemed, within every tradition or school, to be at least a rough sense that the task to be done was mainly one in service of human understanding. And it is the nature and scope of this understanding, as well as the means by which it is sought, that begins to yield clues concerning what it is that might be distinctive about philosophy or, more precisely, about philosophical thinking.

How, then, and in what ways can this way of conceiving of the philosopher's mission or quest, help to shed light on the nature of what philosophers, whose special concern is education, do? Let me begin with a brief remark about education. Generally speaking, we can think of education in at least three different ways, or as involving three distinct, though intimately related, aspects:

(1) as an activity or a series of activities, e.g. teaching and learning,

(2) as the human achievements--emotional, intellectual, moral and social--in which these activities issue, and

(3) as a discipline or sphere of inquiry whose purpose is to understand and further such activities and achievements. (This enterprise is sometimes referred to as 'educational theory'--those who are more empirically-minded often think of it as educational research.

If education is understood as involving at least these three aspects then it would seem to follow from what has been said thus far, that the philosophical study of education is an enterprise one of whose principal aims is developing ways of understanding these varied facets of the educational endeavour that are at once clear, comprehensive, and coherent. Against this background, it is now clearer why slogans such as 'Education is growth' or 'The aim of education is to develop the person's potential', and so on--claims one typically finds in governmental and other "official" pronouncements about the nature and role of education--are not philosophies of education at all, because they lack the clarity. comprehensiveness, and coherence which would in any significant way advance our understanding of education in any or all of its aspects. In short, they are not pictures at all; they are nothing more than splotches of colour in varying degrees of vividness. And of course sensible educators show they are aware of this by virtue of their tendency to take such deliverances, as I whole-heartedly agree they should, with a grain of salt.

I have also suggested that philosophy in general and philosophy of education in particular can be informatively characterised not only in terms of its ends but also by reference to its means and manner of seeking these ends. Consequently let me now try to say something in reference to policies and procedures philosophers commonly enlist in search of an understanding of education.

Typically philosophical thinking about educational matters involves a whole cluster of interrelated procedures and attitudes. In the first place, to achieve the kind of understanding they seek, philosophers will often ask "what questions"; questions of the kind each of the participants in this symposium have asked to tackle, e.g., what is the nature and role, of the fine arts, of psychology, and so on? The point of such questions is quite simply to gain further clarity in the realms of thinking and communication, thus subverting two types of phenomena all too prevalent in educational quarters these days; namely, fuzzy-headed or woolly thining on the one hand, and, on the other, the kind of parallel soliloquy that so often passes for genuine conversation. Both are enemies of understanding! So, for example, when philosophers ask 'what do you mean by a paradigm?' or 'what is the nature of a paradigm?' or 'what is the difference between a paradigm and a world hypothesis or an intellectual research programme?' they are not merely quibbling over "semantics" but are attempting to lay the groundwork for understanding by getting clearer about what is under consideration. A second and equally important instrument in the philosopher's tool kit is the "why" question. Why questions are posed, not as it may sometimes appear, to put people on the defensive--though of course they may have this effect. Their purpose is to determine what reasons there might be for endorsing a given point of view, or a certain set of policies or practices, and for not endorsing others. Philosophical inquiry into education, in other words, is a reason-seeking and reason-giving activity. It strives to unearth, clarify, and assess the reasons we have for holding certain beliefs about, and for pursuing particular courses of action in, education. For example, just such a question is raised in John Olson's very important contribution to these symposia. He has urged us to consider what sorts of reasons there might be for thinking that a formal, disciplinary understanding of science, i.e. an understanding of science from the "inside"; is somehow more beneficial for today's high school students than other kinds of understanding which may also be acquired through the study of science. Clearly, however, not every "what" or "why" question that might be raised about educational thought or practice can be regarded as philosophical. Part of what makes John's question philosophical is the fact that, in order to answer it properly, we must consider the nature of education, the nature of science, the potential contributions of the study of science to the education of human beings, the reasons for favouring one type of contribution over others at this particular point in our history, and so on. In other words, it calls into question a very complex and interrelated system of beliefs, together with associated patterns of activities, and the fundamental presuppositions on which they rest. In brief, it requires that we strive to develop a more adequate understanding of the role, or possible role, of science education in the preparation of young people to face the kind of future we, in the light of our best available knowledge, can now foresee.

In addition to being distinguished by a recognizable set of purposes and procedures, philosophical thinking about education also embodies a certain cluster of attitudes. Among the more important of these is a willingness to "step back", as it were, from even one's most cherished beliefs or deeply felt convictions and subject them to scrutiny as the need arises. This we might describe as a reflective attitude. Intimately bound up with this in philosophical thinking is a critical attitude; which, to paraphrase D.J. O'Connor (1957, p. 27), is characterized by a willingness to proportion the degree of confidence one has in one's belief according to the adequacy of the reasons there might be in support of them. The subtle interplay of these two habits of mind is also reflected in John's question. For to take it seriously, as a genuine philosophical question, requires that one step back from currently accepted beliefs and prejudices and attempt to discover whether there may be good reasons for maintaining them; or whether, instead, there are compelling reasons for surrendering them in favour of a search for more adequate forms of understanding. One facet of this kind of reflective-critico-creative thinking is eloquently characterized by Dewey (1926, p.222). In explicating one of the requirements for this kind of activity he says:

> Freedom of thought denotes freedom of thinking, specific doubting, inquirying, suspense, creating and cultivating of tentative hypotheses, trials or experimentatings that are unguaranteed and that involve risks of waste and loss of time. Let us admit the case of the conservative; if we once start thinking no one can guarantee where we shall come out, except that many objects ends and institutions are surely doomed. Every thinker puts some portion of an apparently stable world in peril . . .

And so it may well be with Professor Olson's question.

## II

After having provided a fairly general sketch of some of the important features I take to characterize the philosophy of education, I should like to further clarify matters by making a number of rather more specific observations concerning my own views of the roles, or potential roles, of this kind of inquiry within the domain of educational thought and practice. I will do this in two stages. First, I shall outline in broad terms the role of the philosopher of education as I see it. I shall then draw attention to four areas within this domain where, in my view, philosophical inquiry has particular and important contributions to make, and provide very brief examples of the sorts of issues I believe can and should be addressed within each of them.

Israel Scheffler (1966, p. 5) offers a succinct yet lucid portrayal of some of the main contributions of the philosopher of education. He points out that:

> He can try to clarify our fundamental ways of thinking about education: the concepts we employ, the inferences we make, and the choices we express. He can render explicit the criteria of judgement we use in reaching educational decisions. He can test our common assumptions indirectly by striving for a systematic picture that will embrace them all. He can analyze the major positions taken on matters of educational policy, by exposing their premises, consequences and alternatives. In sum, he can improve our understanding of educational contexts and the problems they generate.

Obviously, if we understand the tasks of philosophical thinking in and about education in the way Scheffler proposes, then it is not difficult to see why the misconceptions discussed earlier must be rejected out of hand as nothing more than simple-minded caricatures.

As I see it, there are at least four different, though closely related, contexts in which philosophers of education can exercise the vital functions Scheffler has enumerated. These are: (1) in the education of teachers, (2) in the shaping of educational policy, (3) in the conduct of fundamental research into areas of educational concern, and (4) in interdisciplinary activities, such as these symposia. Owing to the constraints imposed not only by the circumstances but also by the very nature of the subject matter with which I am dealing, I cannot pretend to offer anything more than a very rough "thumbnail sketch" of some of the possibilities. To do justice to them is a task far beyong the scope of the present undertaking.

(1) The education of teachers. In their day-to-day activities in classroom the aim of the teacher is to change, often in fundamental respects, the ways in which students think, feel, and act, as well as the things they value and believe. In other words, in the course of attempting to educate those for whom they are responsible, teachers must exercise judgement in choosing the particular ends they will pursue, in deciding upon the emphasis various chosen ends will be given, and in selecting appropriate means to

be employed in realizing those ends. Clearly, then, every aspect of a teacher's activities has philosophical dimensions, because every choice or decision requires the exercise of judgement. And making these judgements, in turn, inevitably involves the teacher in a host of unexamined commitments, many of which are so commonplace that they simply have no appreciation of their status *as assumptions*. Furthermore, depending on the decision taken, radically different consequences both for the pupil and for the teacher may ensue. Here, once again, one very often finds that teachers are unable to appreciate the different sorts of consequences associated with alternative ways of proceeding (cf. Elliott, 1976-77). A little reflection on even the most routine and seemingly straightforward activities (e.g., evaluating a test paper and assigning a mark; deciding whether to mark on the basis of a student's ability or achievement; or determining the criteria for a passing grade) very quickly reveals that underlying these practices, taken from a *single* sphere of a teacher's typical activities, is a complex and far-reaching network of assumptions--assumptions of which even some of our more enlightened educators are only dimly aware.

In order that teachers be brought to a better understanding of what is involved in the many judgements they make and to a fuller appreication of the kinds of alternatives open to them, it is imperative, in my judgement, that they come to think *philosophically* about what they are doing, as educators, and why. And, of course, it cannot be overemphasized that one important aim of this kind of thinking must be the improvement of the quality of educational practice. As such, this is a task that should be begun during the initial stages of preparing teachers to assume their classroom responsibilities.

(2) *Educational policy making*. Little more needs to be said concerning the role of philosophical inquiry in the making of educational policy than I have already said in reference to the part it can play in the work of the classroom teacher. In both contexts, an adequate understanding of what is involved in the selecting of one course of action over others is essential to informed, intelligent, and rational decision-making in both contexts. Indeed, perhaps the only difference in the types of judgements made in each area, at least from a philosophical point of view, is mainly one of scope.

Even a cursory appraisal of contemporary discussions of educational policy reveals a welter of claims and counter-claims, charges and counter-charges--all of which serve to generate considerably more heat than light. As a result, this is another context in which philosophical thinking has a significant contribution to make. For example, the fundamental confusion and misdirectedness that characterizes much of the current debate concerning such topics as the "core curriculum," "Literacy," compulsory course requirements, and so on, testifies eloquently to the need for the development of clear, comprehensive, and coherent pictures which will inform us of precisely what is at stake and what our available options might be.

(3) Participating in fundamental research. It has long been assumed by educators, especially those involved in educational research, that the proper route to *bona fide* knowledge about practical educational matters is through the social sciences. It has been taken for granted that from a careful study of the theories currently accepted in various branches of psychology, sociology, and so on, one could derive, very directly, implications which would significantly inform and ultimately reform the business of teaching and learning. Of late, however, an increasing number of voices from this quarter of the educational community can be heard to be raising serious doubts concerning the tenability of this way of approaching educational inquiry. R.S. Peters (1974, p.58) expresses this mounting concern very well when he remarks that:

> One of the things that has depressed me most has been the dearth of limited generalisations established by psychologists in fields such as learning, academic motivation and class-room control. And one of the inhibiting factors has surely been the yearning for scientific respectability of psychologists working in this field which they have imbibed from departments of pure psychology. Instead of setting out concretely what needs to be known and trying to devise ways of decreasing our ignorance at the coal face, as it were, they have tried to apply some piece of one of the classical theories in this field and have consequently bored generations of teachers to death with these irrelevant pieties. In the field of human learning, for instance, the tendency has been to extrapolate some generalisations taken from Hull or Skinner to fields which, in my view, they have only marginal relevance. No wonder Piaget, who actually did some work on children, is treated as a kind of messiah.

Now although Peters has concentrated his attack on the "sins" of the psychologists, it takes very little insight to realize that generations of sociologists and philosophers, among others, have likewise been busily trafficking in what Sidney Hook aptly described as "garrulous absurdities".

Granting that we are in important respects ignorant of what does go on at the coal face, an important question that arises is what is to be done in order to remedy this state of affairs? How are we to increase our knowledge in this area? The obvious reply must be that if one wants to learn about what is happening at the coal face one is far better off going there to find out than remaining at headquarters speculating about these matters, perhaps with the aid of the geologist's preliminary report on rock formations. The point is that if we want to gain a better understanding of teaching and learning then surely it is reasonable to suppose that it may actually be useful to begin by studying what teachers and pupils do, when one sets about the business of getting the other to master certain skills or to acquire a certain body of knowledge. But if one's concern is fundamental research then the simple business of going and looking is by no means sufficient. In the past, researchers have gone, looked, and returned little the wiser about these matters, because their observations have been made through the eyes of the "grand theories" that Peters has mentioned. At best those efforts represented applied research, in the sense that the activity involved little more than using concepts and theories, generated in very different contexts to serve very different purposes, in order to account for what occurred when the class was "in session". Fundamental research, in the sense intended here, is an enterprise whose principal concerns are the creation of new concepts and the development of new theories--not the uncritical application of the old ones.

Furthermore, as one begins to move away from the traditional, discipline-based view of education (according to which learning is the exclusive preserve of the psychologist; norms, conventions, and rules the property of the sociologist; and goals and values the domain of the philosopher, and so on) in search of more adequate ways of representing educational "phenomena", one soon begins to realize that what had once acted as a formidable roadblock to communication and cooperation among workers in these various fields now gradually begins to disappear. That is, the conceptual and theoretical trappings which, heretofore, have tended to act as obstacles to any form of cooperative endeavour come to be seen as valuable resources to be employed in constructing fresh ways of looking at and attempting to understand the very complex business of teaching and learning. During this past year, for example, a number of us in the Faculty of Education have gotten together to try to devise ways of coming to grips with the problem of how students attempt to come to terms with the complex and highly formalized bodies of knowledge, e.g., mathematics, they encounter in the course of their schooling. And, more recently, another research team, composed of people of equally diverse academic backgrounds, has been formed in order to study the activites of excellent teachers. The latter group's objective, to find ways of representing what it is that excellent teachers know, also involves them in fundamental research. In both instances the tools and resources of psychologists, sociologists, and philosophers are being deployed in an effort to make inroads into the sort of problems that have until quite recently loomed as insuperable barriers in the road to a better understanding of educational activities and achievements.

In presenting a thumbnail sketch of the potential contributions of philosophical thinking to research in education I have deliberately skirted a number of important issues, some of which are highly controversial. To those interested in exploring such matters further, I would direct them to the growing body of literature in this field (c.f. Mischel, 1969, 1971, and 1974; and Toulmin, 1972).

(4) Interdisciplinary activities. In discussing the role of philosophical inquiry in the context of fundamental research into educational practice, I have already stressed the interdisciplinary character of this venture. Nevertheless, there are other spheres in which it seems equally desirable to explore the possibilities of engaging interdisciplinary cooperation with other sorts of educational purposes in mind. Presumably this is one of the principal reasons behind this series of symposia. With this in view I shall illustrate one type of contribution that philosophers might make by listing a number of questions of the sort that philosophers would typically raise in reference to any undertaking of this kind.

a. How do we go about characterizing various activities as disciplines and as non-disciplines?

b. How do disciplines differ among one another?

c. How, or in the light of what principles, does one adjudicate disputes arising from rival accounts of these matters? And what is the status of such principles?

d. How, and with what justification, would we make this kind of interdisciplinary understanding available to youngsters in the course of their education?

e. On what basis might disciplines be integrated, and to what ends, in educational contexts?

f. How might disciplinary understanding of this order map on to students non-disciplinary ways of viewing this world?

These represent a sampling of some of the questions a philosopher would think it important to address at some point during any deliberation whose purpose is expressly to find ways of integrating the diverse and multifaceted offerings of the various discipines, so as to make them available to students in a form that is both economical and intelligible.

## III

If, as I have maintained, the philosophy of education is an attempt to create clear, coherent, and comprehensive views of the educational world--of our activities and achievements within it, in some of the ways I have suggested, then one can begin to see how the understanding a philosopher seeks might well be equated with vision.

But, lest we lose sight of who the real philosophers among us are, let us not fall into the trap of supposing that "credentialing" does the trick. Rather, following William Heard Kilpatrick (1951, pp. ix-x), and the influential discipline of Dewey, I would prefer to regard as a philosopher

> any person who is willing to question his present point of view, who is open to critical examination of his own views and those of others, [and] who is earnest in his search for deeper, finer, [and] more defensible values.

## Postscript

To propose as I have done here that we conceive of philosophy, and any other discipline for that matter, as an activity (or "process"), rather than as an achievement (or "product"), is to underscore the point that what is distinctive about a particular discipline is to be found not so much in the concepts and logical structures it employs to represent its findings as it is in the purposes it has and the procedures it uses in trying to achieve those purposes. From this point of view, no longer does one attempt to distinguish between, say, physics and philosophy solely by appeal to the concepts each uses and the way in which each tests its claims, or, even more naively, by considering the subject matter with which each is concerned. Instead, one tries to determine how the purposes and procedures of the physicist and philosopher differ; and it is this which marks off the one form of inquiry from the other.

And so it is with differences within disciplines themselves. Very often the uninitiated are overwhelmed by the seemingly radical differences in the "thought" of philosophers such as Plato, Locke, Kant, Marx, Russell, Heidegger, and Wittgenstein. But, it seems to me, that on gaining a deeper understanding and appreciation of what they were trying to achieve and the means by which they sought to achieve it, many of these differences begin to lose their significance.

## Acknowledgement

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# PHILOSOPHY: ITS NATURE, ROLE, AND FUTURE

## A Sketch Toward a Discussion

Millard Schumaker

## 1. The Image of Philosophy

I must begin by explaining who I am and how it is that I wish to speak. I am a trained philosopher, but I teach on the border between religion and ethics in a Department of Religion and in a Theological College. As a result, my students (and at times also my University colleagues) usually think of me as a theologian rather than as a philosopher. And because they fail to recognize the philosopher within me, they sometimes speak candidly of their anxieties about the state of philosophy today. What I hear is not infrequently distressing in the extreme. Much of what I hear rings true, but most of what I hear seems to me, too, to reveal great misunderstanding and perhaps even a culpable lack of appreciation. I believe in philosophy, and I believe in it passionately; and so I will do what I can to come to its defence; but (if I might be allowed a literary paradox), I will try to do so as non-defensively as possible: no doubt philosophers have much to learn from their critics; but their critics in turn stand to learn much from those who have considered deeply the nature, the potential, and also the limits, of philosophical thinking. I hope that what I have to say might be of interest to my philosophical colleagues, but I also want to be understood, and fully understood, by everyone else; and so I will deny myself the convenience of philosophical jargon and speak plainly.

What, then, is the image of philosophy in our time? One can only begin by commenting that philosophy has fallen upon hard times in the public eye. To the public--including the University-educated public--philosophy has become esoteric and trivial. Now it is probably not all that catastrophic for a discipline to be thought to be esoteric (quantum physics has survived such a reputation unscathed), and perhaps it is not even all that catastrophic for a discipline to be thought to be trivial (many academic disciplines survive despite such a reputation), but to be thought to be both esoteric and trivial is catastrophic indeed! And this is the fate of philosophy today: many people believe that it consists merely of much ado about nothing.

Philosophers are seen as having little relevance to anything--indeed, their presence is often perceived as an annoying hindrance to rational discussion; their contributions are often dismissed as hopeless "nit-picking" (whatever that is), and their modes of expression are seen as obscurantistic in the extreme. To make things worse, the educated public sees the philosophers of today as having betrayed a sacred trust and as having allowed a glorious intellectual tradition to deteriorate and waste away: philosophers are thought to have abandoned their rightful task of metaphysical integration in favour of inconsequential trivia. It is as if they had sold their birthright for a mess of pottage.

More than once when I have served on committees planning intellectual symposia of various sorts I have proposed that philosophers be included among those invited to speak, only to be rebuffed by the challenge that philosophers would have little to add and would probably succeed only in confusing and disrupting the proceedings! I have discovered that in our time it is not expedient (but it may well sometimes nonethless be wise and authentic) to identify oneself as a "philosopher"--and that discovery hurts.

## 2. Philosophy: Its Nature and Role

*Difficulties for Contemporary Philosophy.* The public's difficulty begins with its dim awareness that analysis is the primary business of philosophy. "Analysis" means in philosophy very much what it means in chemistry: to analyse is to break down into constituent parts. In philosophy, what is broken down into such constituent parts are ideas, or concepts--usually signified by words. The primacy of analysis in philosophy means that philosophy is developing (as it always has been) as a deductive discipline, sometimes formally and mathematically, other times informally. And this means that the philosopher devotes especial attention to two matters: implication, and consistency. That is, much of philosophical analysis is devoted to (1) seeing just what the affirmation of any particular idea commits us to beyond the simple idea itself--a task which is accomplished through a rigorous use of the techniques of logical implication--and (2) the exploring of incoherent and hence impossible ideas, proposals, conceptions of reality, etc.--a task which is accomplished through a rigorous application of the canons of consistency.

It should be noted that in developing these analytical techniques, philosophy has been developing techniques which are suitable not only to those rare and extraordinary individuals who appear from time to time in human history but also to the abilities of all men of ordinary intelligence. Thus, like scientific method, the techniques of philosophy can be utilized by everyone, at least to some extent. And, of course, it is also true that these techniques can be deployed trivially, and by very unwise people. When one adds to this observation the fact that these techniques, being deductive, never--in one sense--give rise to any genuinely new knowledge at all, it is not difficult to understand why the public sometimes sees second-rate people producing little, especially when, as the public is prone to do, the results of analysis done by an average Associate Professor of Philosophy teaching in a quite ordinary undergraduate teaching faculty is compared to the results of the analyses done by, say, Aristotle, or Kant.

*The Success of Contemporary Philosophy.* The first response to the critics of philosophy must be defensive; although there is much in the way of trivial and silly things going on in philosophy (just as there is much trivial and silly research going on in the sciences), there is also much of astonishing value in contemporary philosophy; and it is important that these values not be obscured or minimized.

The first thing to be said for contemporary, analytic philosophy is that it has to a great extent regained an important modesty which had been very largely lost, especially in the nineteenth century. The great systems of the past were sometimes and in many respects really not all that "great". What passed for knowledge and wisdom was not infrequently nothing more than pompous prejudice and presumptuous arrogance, and it is in no sense to the credit of the general public that it continues to be gulled by the pretensions of certain philosophers. It is a sad fact that the public can be as foolish about philosophy as it can be about nearly everything else: just as in the fine arts the shoddy can be passed as the precious when it is packaged sufficiently in tinsel and hawked with sufficient vigour, so too it is with philosophy: too often in philosophy people have been willing to buy a bill of goods which simply could not be delivered.

Contemporary analytical philosophy has devoted much of its efforts to self-criticism, and the results of this self-criticism has been a healthy destruction of many of the more dangerous illusions of the great systems. The plodding, mechanical, scholastic analysts of the universities have done at least as much to destroy the pretensions of philosophy as have more flamboyant and more interesting philosophers such as Kierkegaard, Nietzsche, and Marx.

In passing, one might note as well that such self-criticism is no new thing in the history of philosophy; the "way of words" (to use Locke's phrase) as a critique of philosophical speculation is an Ancient Way: Aristotle, Aquinas, and Locke, to name but three, were all "analytic philosophers" in the most ordinary and straightforward sense of that word. Self-criticism is usually painful indeed to philosophers; and it is to the credit of the profession that it has not recoiled from that pain.

But philosophers engage in more than self-criticism; their techniques are as telling against the pretensions of others as they are against the illusions of philosophy; and modern philosophy has had a measure of success in detroying poorly-conceived ideas in other fields; that is, to an extent philosophy has challenged woolly thinking among scientists, theologians, educators, etc. Philosophers have done so by reminding those other professions of the demands laid upon them by those requirements of implication and consistency to which I have already called attention.

I wish that I could claim that philosophy has been as successful in its critique of other fields of knowledge as it has been in its critique of itself, but such is not the case. Failures in "dialogue" have seriously restricted success in these endeavours. An example (unfortunately not atypical): I once attended a speech sponsored jointly by the Departments of Philosophy and Psychology in a good university. The speaker was a philosopher criticizing certain claims advanced by some psychologists. What he had to say was cogent and telling, but his personal attitude toward psychologists was arrogant and insulting to an extreme. The result was that the psychologists in attendance were puzzled and hurt and therefore simply unable to hear his criticism at all. The fault lay in that philosopher's personal attitude and not in his technique, but the result was that his analysis was wasted: it was the psychologists, after all, and not the philosophers, who stood to gain most from his criticism.

My conclusion, then, is this: despite many failures and shortcomings, contemporary, analytical philosophy must be credited with many successes; and I would propose that these successes will continue only if the public allows true freedom for the philosophical community, encouraging it to continue to find its own way, in its own way.

## 3. Philosophy: Its Future

*Refining Techniques.* I want to propose that the true future of philosophy lies not in retrenchment and retreat, but in creative and confident advance; and I want to propose that the first priority in such creative and confident advance consists in further refinement of techniques already well-developed. I have in mind especially advanced logics, even esoteric logics, detailed investigations, persistence in areas others think to be self-evident, etc. Further refinement of such techniques will have the inevitable consequence of removing philosophical reasoning even further from the educated general public and will inevitably cause philosophy to become even more esoteric than it already is. Personally, I regret this; but I would regret even more a failure of nerve on the part of the profession which might cause the abadoning in the middle of things of techniques now only partially perfected but already of proven value to the intellectual life. The future of philosophy, then, requires the further elaboration of methods whose efficacy has already been proven time and again.

But the perfection of techniques already known to be useful is not enough to secure philosophy's future. There are other techniques, techniques which at this time are not at all well-developed, which are clearly important and must be taken up and improved as quickly as possible. In my view, the most important of these have to do with what is sometimes called "phenomenological description". Like other people, philosophers tend to see what they want to see; they have difficulty understanding the views of others; they do not find it easy to develop the creative patience to get past alien vocabularies and strange modes of thought. The result is that philosophers (like other people) have difficulty in seeing and hearing what is really there. When perception in this way becomes stupid and fails, analysis is largely wasted.

There was a time in my life when I was addicted to auctions, a personality disorder which I have subsequently corrected. One of my favourite auctioneers was fond, when he failed to receive what he took to be unsatisfactory bids, of saying, "You folks just ain't seeing things right". In my opinion, his observation is especially telling against contemporary philosophy: too often philosophers fail to see things right. Philosophy, and especially philosophy in the English-speaking world, has a long way to go toward developing techniques for adequate seeing and hearing; but I am especially hopeful that progress along these lines will be forthcoming, probably in our own time.

*Converging upon wisdom.* I am seeking a healthy future for philosophy, and my first proposal has been that such a future requires that philosophers have the courage to continue to refine their techniques, even in the face of a hostile public. But (as that hostile public so rightly insists) philosophy is clearly more than technique; indeed it could almost be said that technique is but a necessary prolegomenon to authentic philosophizing. Philosophy, after all, is finally a pursuit after wisdom; and it would be shameful indeed were philosophers to forsake the ideal of wisdom. Wisdom, I would submit, consists largely in the ability to put first things first, to know how to put things in the right perspective, to understand when to venture and when to retreat; wisdom consists in the development of a measure of genuine intellectual poise which allows the wise man to keep his balance in an insecure and problematical world.

As an aside, let me recall a curious change in our language. When I was an undergraduate student, I was taught by, among others, professors of psychology and professors of philosophy. I only rarely referred to those who taught me psychology as "professors of psychology"; instead, they were "psychologists"; but I only rarely referred to those who taught me philosophy as "philosophers"; instead, they were "professors of philosophy". Why the difference? Because while "psychologist" was an occupational designation applicable to competent and incompetent researchers alike, "philosopher" was an honorific title applicable only to the genuinely wise and creative. An unwise "philosopher" was no philosopher at all. Anyone who could pass certain minimal examinations could be a psychologist (or a chemist, or a physicist, etc.), but only a few would ever be philosophers--and only time would tell which persons they would be.

Today all this has changed; now even graduate students in philosophy are regularly referred to as "philosophers", much as medical students are called "Doctor". This shift is the inevitable outcome of the refinement of philosophical technique to the stage where it can be utilized by nearly anyone of reasonable intelligence, and I expect that it will never again be the case that to be called a philosopher is to be assured that others recognize one as a truly wise man, as a sage. I do not really regret this development, but I do think it important to note that the passing of the honorific use of "philosopher" greatly increases the possibility that the philosophical community might forget that its primary task is the cultivation of wisdom.

I would submit that the future of philosophy depends to a very great extent upon whether it is able to continue to cultivate and encourage not only knowledge but also wisdom, and I would further submit that such cultivation will require some changes in the way in which philosophy is being done--shifts mostly toward a looseness and an openness. For example, philosophers will have to become better able to know when to think and when to look. In my own experience perhaps the single most important sentence in modern philosophical literature is Wittgenstein's marvelously revealing exclamation: "Don't think, but look!" And, of course, to this one might well add, on other occasions, "Don't look, but think!" The trick is to know when to do which; and to know that requires a certain wisdom conceived of as a sort of intellectual poise.

In addition, I would submit that philosophers and non-philosophers alike will have to begin to understand more clearly that communication with others is an integral part of the philosophical endeavour and not a sort of extra, a sort of bonus. The philosophical enterprise is a public enterprise--think of Socrates' horsefly biting the butt of every Athenian--and "in-group" philosophy is therefore clearly a vanity, and a silly vanity at that.

Yet again (as I see it) philosophers, if they are to pursue wisdom, must learn to be less dogmatic, less narrowly consistent, more open, and even more eclectic. Philosophers tend to dismiss as unimportant Emerson's warning that a foolish consistency is the hobgoblin of little minds, but they have done so (as I see it) rather foolishly. The rapid development of precise philosophical techniques has tended to cause philosophers to forget that much in philosophy cannot wisely be reduced to precision. Long ago Aristotle reminded us of the impertinence of drawing precise conclusions from imprecise premisses. If a man has fifty dollars in one savings account and fifty dollars in another, it would be correct to say that he has one hundred dollars in his savings accounts and incorrect to say that he has about one hundred dollars in savings. But if he has about fifty dollars in one account and about fifty dollars in the other, it would be similarly correct to say that he has about one hundred dollars in savings and incorrect to claim that he has precisely one hundred dollars in his accounts. Some philosophical problems and hence some philosophical conclusions can be wisely expressed with precision, but most philosophical reasoning is very imprecise indeed, and the wise philosopher will conceal this fact neither from himself nor from others.

A metaphor which I have found useful: when I was in high school I took two courses in drawing: one was a course in sketching offered by the Department of Art, the other a course in mechanical drawing designed to produce draftsmen. As a draftsman I was taught to produce drawings which were accurate and precise, each line corresponding exactly to the reality or idea it was meant to represent. As an artist, however, I was taught to "sketch-in" the picture; and as I sketched, although not a single line corresponded to the reality, the totality of my drawing gave a more-or-less (in my case rather more less than more) faithful representation of what I had in mind. Roughly, my proposal is that the wise philosopher is usually more like an artist sketching than like the draftsman confidently producing precise images; and this, I would argue, is due to the inevitable looseness of much human knowledge. Wisdom in philosophy demands the freedom of the artist at least as insistently as it demands the mechanical precision of the draftsman.

## 4. The Image of the Whole

Having now proposed that a healthy future for philosophy demands both a refinement of technique and a convergence upon wisdom (and I recognize an inevitable tension between these two desiderata), I want to suggest that these two ideals can help make philosophy more able to contribute meaningfully to an image of the whole. I believe this to be the case because I believe that philosophers who see themselves in this way will be not merely specialists in their own domain but also able to contribute directly a new dimension to all knowledge.

Sometimes that contribution will be the negative one of debunking foolishness, and for this reason the philosopher must resign himself to the uncomfortable fate of always being to others an unwelcome subversive. The discomfort of this fate should not be underestimated; neither should one underestimate its importance or inevitability. Other times the contribution will be positive: the philosopher will be able to help (he will probably not be able to do it alone) to put together through an educated balance the fragments of our partial knowledge. In this sense, he will become a sage. The importance of this task must not be underestimated; neither must we underestimate its difficulty; nor should we underestimate the arrogance which it will probably engender. But it is a task which must be undertaken, regardless of risk.

It must be clear that my hopes for philosophy are very high indeed. I think that I see in contemporary philosophy a rapidly developing and maturing discipline, one which is carrying its load today and one which will continue to carry its load tomorrow. But I am also quite clear in my belief that this maturing of philosophy has not in the past and will not in the future come easily. In fact, I believe that the immediate future will be a very difficult one. Although I do not want to overstate my case, I believe that philosophy is presently entering the mystic's Dark Night of the Soul, a chastening, and even a conversion--a conversion, I propose, to the truly Socratic attitude of creative, constructive listening; or, to change the image, philosophy is entering a time in its history not unlike the time of expectant listening for the Quaker, silent in his meeting.

I do not know what will arise at the other end of such silence and expectant listening, but I hope provisionally for at least two specific things: first, the restoration of wisdom to a central place in philosophy, perhaps even accompanied with a partial restoration of the use of "philosopher" as an honorific title rather than merely as an occupational designation; and, second, the development for our time of a true metaphysics which will come after physics rather than before: a wise ordering of all we know about ourselves and our world based upon wisdom and uttered by men in whom we have reason to believe and whom we can in good conscience trust. Of course, perhaps we will not be so lucky (most generations are not); I will be content if we can honestly say that we tried.

## A Short, Select Bibliography of Books about the Philosophical Enterprise

Although the custom is dying rapidly, it was for many years simply assumed in the English-speaking world that one should begin the study of philosophy with Socrates' prison dialogues. Whitehead once remarked that the entire history of philosophy is a footnote upon Plato's work. I would revise this and claim that it is a gloss upon Socrates' mission. My favourite translation of the prison dialogues is I.A. Richards' *Why so, Socrates?* (Cambridge, at the University Press, 1964). Following this, the beginner would do well to go on to the mature Plato, especially his *Republic*. A good translation is F.M. Cornford's *The Republic of Plato* (London: Oxford University Press, 1941).

Short, introductory texts are also very useful. Three were especially helpful to me: Angus Sinclair, *An introduction to philosophy* (London: Oxford University Press, 1944); John Wilson, *Thinking with concepts* (Cambridge, at the University Press, 1963); and E.R. Emmet, *Learning to philosophize* (London: Longmans, 1964). All three are British; all three present a moderate view of analytical philosophy.

Sometimes it is helpful to learn from major philosophers with the aid of a skilful interpreter. I am aware of two books which are especially good at this: Ved Mehta, *Fly and the fly-bottle: Encounters with British intellectuals* (Harmondsworth: Penguin Books, 1965); and Sydney and Beatrice Rome, *Philosophical interrogations: Interrogations of Martin Buber, John Wild, Jean Wahl, Brand Blanshard, Charles Hartshorne, Paul Tillich* (New York: Holt, Rinehardt and Winston, 1964).

Hans George Classen offers an excellent review of Canadian Philosophy in "The relevance of philosophy," *Queen's Quarterly*, 84.1 (Spring 1977), 1-17.

It is rather well known that the philosophical world is split into opposing camps, groups who often are unable even to talk with one another. An interesting and readable (but demanding) attempt to do something about this is Morton White's *Toward reunion in philosophy* (Cambridge, Mass.: Harvard University Press, 1956).

A secondary source which details in a way suitable to beginners the thought of several American philosophers who have been especially interested in an "image of the whole" is Andrew J. Reck's *The new American philosophers* (Baton Rouge: Louisiana State University Press, 1968).

For better or for worse, much (perhaps most) serious philosophy is published not in books but in journals. My personal opinion is that the best of these is the *American Philosophical Quarterly*, edited by Nicholas Rescher. There are two good Canadian journals: *Dialogue: Canadian Philosophical Review--Revue canadienne de philosophie*, edited by Francois Duchesneau and John Woods, and *Canadian Journal of Philosophy*, edited by John Heintz, John King-Farlow, and Kai Nielsen.

# THE SCOPE OF MODERN COGNITIVE PSYCHOLOGY

P. C. Dodwell

It has become quite commonplace to state that academic psychology has suffered a revolution in the past decade. Indeed it could be argued that revolution is psychology's usual state--perhaps not surprising in a young discipline anxious to establish its credentials as an empirically-based science. The effort to prove scientific respectability was no doubt overdone, especially in the heyday of Behaviourism, a philosophy of radical scientific positivism. Behaviourism held a dominant position in North American psychology for two or three decades and was only gradually edged from centre stage in the fifties and sixties (Koch, 1959; Dodwell, 1972).

What characterizes Behaviourism? It is a conglomerate of beliefs and attitudes about scientific method and its objects of study. In its strongest form (Watson, 1925) it held that the only matters worthy of scientific interest in psychology were public observable events such as spoken words, body movements, measurable physiological changes and the like. Such things as thoughts, beliefs, and images were considered to be unobservable in principle, except to the individual experiencing them, and therefore literally meaningless terms in the context of public scientific discourse. This radical position could not be sustained, and for two main reasons. The first was that a psychology which excluded cognition and elements of personal experience was a very dull thing; it could not handle adequately vast reaches of human activity and interest. The goal of "reducing" all cognitive activity to publicly observable movements, physiological changes, etc., proved unattainable. The second and more striking reason was that psychologists found it not only unhelpful, but also unnecessary, to bear their self-imposed yoke. It became clear that many of those "inner" events thrown out by Behaviourism were indeed susceptible to and worth of scientific study. Whether one called oneself a "subjective behaviourist" (Miller, Pribram and Galanter, 1958) or in the modern idiom a cognitive psychologist, the result was the same. Without throwing out the criteria of observability and the replicability of results which any empirical science holds, psychologists began to demonstrate that language, thinking, imagining and other cognitive behaviours were perfectly amenable to quite rigorous experimental analysis.

What led to Behaviourism's rejection of "higher" mental processes was the mistaken belief that there was some essential connection between the study of mental activity and the method known as Introspectionism (literally, observing one's own inner psychological experience). Introspection was found wanting as a reliable scientific method; different individuals simply could not agree on what "went on" in their heads while thinking, imagining, and the like. However, we can study cognitive processes in other ways, and an example will indicate how this may be done.

Memory can be studied objectively, even though it usually involves private, personal experiences. One can ask a subject in an experiment to read a passage of text, or look at a visual scene, and afterwards report on what is remembered. The verbal report is public information, and can be used to infer, for example, how accurate and complete the memory is, or what systematic changes occur with increasing delay between the initial experience and the report. Many facts can be discovered in this way about memory (e.g. Hunter, 1957; Baddeley, 1972). How one experiences one's memories (by introspection) may be important and interesting, but it is not the only way of studying memory and certainly not the most reliable. What is true of memory is true of other cognitive processes to a large degree, as we shall see.

One of the earliest and most profound influences in the anti-behaviourist revolution was the work of the Swiss developmental psychologist, Jean Piaget. Trained originally as a zoologist, he brought to the study of psychology many of the concepts and methods of biology. His theory of intelligence is really a biological model of rational behaviour (Piaget, 1950). He thought of the intelligent organism as an active biological entity in which "intelligence" is the most advanced manifestation of adaptation to a given environment. In fact his theory of intelligence is a theory about different methods and levels of adaptation. At the lowest level the human infant is held to develop sensori-motor schemas which allow it to adapt to elementary events like feeding, reaching, manipulating and changing location. The schema "accommodates" to the environment (use of a bottle, spoon, cup, for example) and "assimilates" these objects to its feeding schema.

Thus the structure of even simple behaviour arises from both natural response tendencies--Piaget called them reflexes--and the structural characteristics of the environment to which the child must adapt its activities.

On this basic conception Piaget builds a series of models of ever more complex behaviour, but always with the biologically adaptive principle at the forefront of his ideas. The motive force for proceeding from one level to another is provided by the lack of generality of the adaptive schemas at the lower levels. The full structure of mental life, or of intelligent behaviour, finally emerges as the most complete, and most stable, as well as the most highly adaptive, state of the mature individual. The evidence on which this theorizing is based is clearly behavioural (observation of what children of different ages actually do and say when confronted with various tasks) although the model itself is equally clearly a model of mental events.

Piaget's work has been criticized from several points of view, not the least of which concerns the firmness of the empirical basis for his theorizing. If his models were correct, children should proceed through a well-defined sequence of stages in their coping with the world, both practically and intellectually. But the fact seems to be that there is quite a bit of variety both in the timing and sequencing of these behaviours in different children (e.g. Dodwell,1960). Much intellectual effort has gone into discussing, and examining experimentally, this variation from Piaget's predicted pattern, (Pascual-Leone, 1970). This is not the place to go into the disputes; suffice it to say that Piaget's theories still hold a prominent place in our attempts to understand child development, and still are the intellectual source of much current research in the cognitive aspects of child psychology.

A different and, in the long run, more important line of criticism is concerned with the nature of Piaget's theorizing. Despite its adaptive developmental character, Piaget's concept of intelligent behaviour can be regarded as too static. It depicts certain stages of rational or quasi-rational behaviour as ideal states through which the individual progresses, finally ending up as a perfectly rational being, with a complete, well-ordered and stable system of mental "structures" and operations. Yet people are not like this. There are certainly individual differences in ability, experience, and interest which account for many differences in behaviour which are ignored by the theory; but this is not all. There are differences in styles of thought, in strategies for problem solving, and even in the preferred modality of operation. As important distinction can be made, for instance, between imaginal and verbal methods of handling cognitive tasks, and there are wide differences in people's styles of problem solving, for instance in ability to take a high mental load, in risk-taking, the ability to focus broadly or narrowly on the different aspects of a problem, and so on (Bruner, Goodnow & Austin, 1956). One could argue that Piaget was led astray by too heavy a reliance on biological models. His concept of the "ideal" problem solver is like a genotype, a fixed and immutable core to the functioning system. This sounds more like a logic machine or computer than a man.

Another area in which the Piagetian approach has been generally held to be deficient is in its treatment of language, both as an index and as a tool of intellectual development. Since language is the topic of the following paper, I will not pursue that matter. It is instructive to consider, however, what a Piagetian theory of language might be like, because it highlights again the weakness of the Piagetian approach to mental events. Such a theory of language would presumably assert that children progress through several well-defined stages of language development, each one characterized by particular schemas (sentence forms, grammatical constructions, etc.) which form an interdependent and stable "structure". Development from one stage to another would be motivated by the incompletness of the structures at all but the highest level i.e., their inability to serve all the purposes for which the child needs language. As a matter of fact young children do progress through several quite well-defined stages (Brown, 1971) but it is also quite clear that within a stage the child's execution is usually far from perfect--as is the adult's for that matter. Nor do we know much about the transition between stages. A distinction has therefore been drawn in this, as in other areas of cognitive psychology, between Competence and Performance. What the individual knows is not always perfectly reflected in what he or she does. The Rationalist theorizers like Chomsky (1968) and Piaget tend to stress the inner structure which organizes and directs cognition, whereas Empiricists tend to emphasize the importance of experience, training and motivation in all behaviour.

It is in these latter factors that the distinction between man and machine are most clearly evident, as Neisser (1967) has pointed out. Style, strategy, and interest are characterizations of people, not of computers. Nevertheless, in an important sense it is knowledge of the inner processes, or mental "operations", which will lead to better understanding of cognition, even though actual performance may lag behind the ideal most of the time. It is significant that Piaget and Chomsky have probably exerted a greater influence on modern cognitive psychology than anyone else.

How is it that, having rejected Introspectionism, psychologists are now willing to talk about mental structure, mental operations, and other similar unobservable entities? The answer is, as I suggested earlier, that instead of asking subjects to observe what goes on in their heads, we observe the subjects' behaviour, and from it infer what is happening "in their heads"--i.e., what mental operations are taking place. There may be differences of opinion about what inferences can be made, but the behaviour itself is public and usually not controversial.

Rather than debate the logical validity (or otherwise) of making such inferences to unobservable processes, it will be more profitable to give illustrations of the sorts of experiment in which cognitive behaviour is observed, and the sorts of inference about mental events that are made.

The study of imagery has recently become popular, and one of the first and best known experiments involved studying an observer's ability to say whether a pair of pictures of somewhat abstract three-dimensional objects represented the same object or not. The observer saw the two pictures, and his time to reach a decision was measured. This time was found to be a function of how similar the orientations of the objects in the two pictures were. For example, if both were upright the response time was shorter than if one was upside down with respect to the other. More generally, response time was a simple linear function of the difference in orientation between the pictured objects (Shepard & Metzler, 1971). The authors hypothesized that this simple relationship was caused by "mental rotation" of one representation (at a constant angular velocity!) into the same orientation as the other, before a judgement of sameness/difference could be made. Other explanations are possible, of course, but this seemed to be a natural one, and is consistent with the observers' own reports of what they were doing. Also a number of other experiments have been done to test the idea of mental rotation; for example making comparisons between images of remembered patterns (letters and numbers) with subsequently presented identical patterns in various orientations. The results generally are consistent with the idea of rotation as a real mental operation (Cooper & Shepard, 1973).

What do we mean by the rotation of mental images? Obviously not that there are little ghostly pictures up there in the brain which are rotated like the insubstantial hands of a phantom clock. Rather, our subjects imagine the rotation as if it were real and happening physically. The fact that we do not know exactly how this can be done--what the "mechanism" is--does not mean that the operation is not real. It is certainly real in the sense that we can measure the time it takes to rotate an image through 180°! (The time may be anything from ½ to 5 seconds, depending on the type of pattern and other conditions.) This is part of what is meant by saying we can study mental operations objectively.

Another example concerns the relationship between imagery and language, and their roles in problem solving or other cognitive tasks. There is now much evidence that there are at least two modes of processing, one verbal and sequential, and one spatial-imaginal, (e.g., Posner, 1967; Paivio, 1971). Some people are high imagers, and different materials may predispose people to use different forms of processing. For example, words that are high in imagery (evoke vivid images) are not remembered in the same way as words which are low in that quality. Perhaps even more striking than this is the fact that the way one remembers things depends not only on the to-be-remembered items, but also on the relationships between those items, the context in which they are learned, and the subject's task either at the time the items are presented, or recalled. If one were asked to remember all the words one knew which begin with K, this would be a very different task from remembering all the philosophers who had made significant contributions to the Western Intellectual Tradition. In the laboratory we can characterize more exactly the sorts of memory task which can be undertaken, and study the properties of memory in its various manifestations.

One might ask: What is so special about this type of study? What can psychologists learn about memory, what theories can they hold, that are different from what commonsense tells us about memory? Some philosophers have even argued that the empirical, experimental, study of memory, and especially the invention of theories of memory (and other cognitive activities) are severely inappropriate. What is needed, they argue, is a conceptual analysis of what words like "memory" and "remembering" mean, rather than experimental findings made usually in quite artificial laboratory settings (Malcolm, 1971). This view is not universal among philosophers (Rorty, 1977), but the best counter to Malcolm's line of argument is to show, as I have indicated, that the study of mental operations like imagining and remembering is possible, leads to testable hypotheses and models, and to new knowledge about the nature of cognition. There is a point, however, to be made about the relationship between what the psychologist calls a model of memory and the everyday understanding (or even the philosopher's conceptual analysis) of the word memory and what it refers to.

In one sense it is inconceivable that psychologists' study of cognition could lead to any change in our understanding of what it means to think, imagine, or remember. We know what those words mean because we do those sorts of thing all the time. That is the philosophers' point. Conceptual analysis may lead to a deeper or more subtle appreciation of the meanings of those words: what does the psychologists' work contribute? My answer to that question is that the experimental analysis of cognitive behaviour leads to an understanding of what the processes and operations are that make memory, thinking, and the use of language possible.

Cognitive behaviour consists of the exercise of a set of skills. Psychologists study the nature of the skills, how they are acquired and used, how they deteriorate with age or misuse, but always within an understood and accepted conceptual context. It is rather like the study of chess playing (a line of research in which psychologists have had some success, incidentally; Simon & Chase, 1973). One has to understand the game before it makes sense to ask: What makes for a skillful player? To become a Chess Master requires one to acquire a number of component skills, some of which were not well understood before psychologists came on the scene, but those skills would themselves be relatively trivial or meaningless outside the "cognitive framework" of the game. The game itself is explained and understood by conceptual analysis, not by experimental study. Similarly in psychology it is only sensible to study the component skills required to speak a language, for example, if one already knows what a language is.

To return to memory: only when we know what it means to remember something does it make sense to study memory processes. Those processes are mental operations of the sort described earlier, which are more or less well acquired, skillfully used, or appropriately managed. A memory model, like most other models in current cognitive psychology, usually lists a set of component processes which are related to each other in quite specific ways.

The typical information-processing model of a cognitive activity looks like a computer programmer's flow chart, with boxes containing "operations" and lines or arrows showing how one stage of processing influences or controls others. (It should be stated that there is danger here of falling into the pitfall mentioned earlier, namely of treating these flow charts too rigidly and literally: they are functional charts, not little boxes in the brain. Men are not machines.) The point of such charts is that they allow us to model what we believe the component processes to be, and to make inferences, which can be tested in experiments, about the timing and sequencing relations between the various parts. The component processes are the mental operations which comprise cognitive skills. It is found, for example, that in reading and remembering symbols (letters or numbers) from a visual array, a very rapidly-decaying short-term visual store precedes a short-term verbal or acoustic memory of longer duration but limited capacity--it can hold about seven items. This in turn is related to a more durable long-term memory where items tend to be stored in terms of semantic properties (meaning) rather than acoustic or other physical attributes (Baddeley & Patterson, 1969; Coltheart, 1972). Discovery of these processes and the relations between them has, in fact, led to a good deal of knowledge of how this particular form of memory works. That knowledge is likely to be of importance in understanding the process of reading, how it is acquired, and how it can go wrong.

Thus the answer to the philosopher's objection is a practical one; it can be shown that psychological investigation of cognitive functions is useful and valid. This does not deny completely the philosopher's argument that psychological investigation does not add to our understanding of what memory (or any other cognitive activity) is, for he is arguing mainly about our understanding of what the word memory means.

A certain disappointment with the aims and achievements of academic psychology is frequently expressed. I think we can now see why this is so, and that it stems from an unreasonable expectation of what psychologists should be able to explain, and a misunderstanding of what they do. Psychologists study cognitive functioning within a given conceptual framework of purposive behaviour. The idea that psychologists can or should attempt to alter our concept of what a human being is, what values he can or should pursue, of what we should strive for in life, is therefore misplaced. We, as psychologists, have a more modest aim, which is to understand how people function, and to help them if they misfunction, but hold no mystical or especially authoritative brief concerning humanity by virtue of the scientific training and interest which leads us to study human behaviour. Modern cognitive psychology studies process, not purpose.

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# COGNITIVE PSYCHOLOGY AND EDUCATION:
# AN EXAMPLE FROM DEVELOPMENTAL PSYCHOLINGUISTICS

Harry Osser

Research on child language until the early sixties was primarily taxonomic. The words children used were classified into the adult parts-of-speech, and their sentences were described as simple or complex, without explanations of developmental changes being offered.

However the introduction of generative-transformational grammar in linguistic theory by Chomsky (1972) has had a profound effect on the study of child language over the past fifteen years. Essentially he proposed that a grammar of a language is more than a taxonomy of structures. For example, there is a close relationship in the following set of sentences:

1) The man threw the ball.
2) The ball was thrown by the man.
3) Did the man throw the ball?
4) Who threw the ball?
5) What did the man throw?
6) It was the ball that the man threw.

The theory of generative grammar attempted to account for this relatedness among sentences by positing an underlying system of rules.

One of the major influences of the theory on the study of child language is that it provided a new and more explicit account of the adult model with which to compare child utterances; in addition, the theory changed the goals of child language research.

Chomsky emphasized that a native speaker of a language has the ability to understand and speak an indefinite number of grammatical and meaningful sentences in that language that he has never heard or said before. In language, the child's linguistic input represents an incredibly small sample of all possible sentences. Since the child obviously cannot hear all possible sentences he needs to learn the system of rules for semantic-syntactic combinations of words that underlie all possible sentences in the language. In the Chomskyan view the child acquires a generative grammar which, although manifest in the speech he hears, is not directly accessible. The major goal of research in the 1960's following Chomsky was the search for grammar in child speech.

Beginning in the 70's there has been a marked shift in child language studies. Researchers now attempt to specify the links between the child's language and other aspects of his cognitive development. There has been a corresponding shift in linguistic theory. The role of semantics in grammar is a major issue in linguistics, as it has become increasingly clear that semantics and syntax cannot be analyzed apart from each other. New semantic based models of linguistic theory have appeared in the work of, for example, Lakoff (1971), Chafe (1970), and Fillmore (1968), and the new goal in developmental psycholinguistics is to develop a theory to represent children's knowledge of language, and how it develops.

One example of the "new" research is Clark's (1973) study of the development of word meaning (see Table 1). She proposed that the very young

Table 1

A Sample Instance of Overextension and Restructuring

| | Word | Semantic domain | Possible criterial feature(s) |
|---|---|---|---|
| Stage I | bow-wow | dog(s) | shape |
| Stage II | bow-wow | dogs, cows, horses, sheep, cats | shape |
| Stage III | (a) bow-wow | dogs, cats, horses, sheep | |
| | (b) moo | cows | sound, (horns?) |
| Stage IV | (a) bow-wow | dogs, cats, sheep | |
| | (b) moo | cows | sound |
| | (c) gee-gee | horses | size, (tail/mane?) |
| Stage V | (a) bow-wow/doggie | cats, dogs | size |
| | (b) moo | cows | |
| | (c) gee-gee/horsie | horses | |
| | (d) baa | sheep | sound |
| Stage VI | (a) doggie | dogs | |
| | (b) moo | cows | |
| | (c) gee-gee/horsie | horses | |
| | (d) baa lamb | sheep | |
| | (e) kitty | cats | shape, sound |

(From E.V. Clark, "What's in a Word. On the Child's Acquisition of Semantics in his First Language") child initially learns the meaning of words by attending to certain perceptually based *semantic* features, i.e., aspects of objects that can be *seen*, *heard*, *felt*, and so on. The child initially shares with the adult only a small portion of the common semantic features that specify a word, and his task during the course of development is to learn more and more of these features. She illustrates the argument by citing examples of *overextension*, where children extended the use of a word to things that *shared* a perceptual feature, such as size and shape, and *restructuring*, where word categories are reordered as the child is able to attend to a larger number of perceptually based features of objects.

Clark's argument is not comprehensive in that children also acquire words that do not lend themselves to the kind of feature analysis that is based on perceptual attributes of objects, e.g., "more", "there", and "this". The meaning of "more" is inherently relational and may well be independent of particular perceptions or actions.

In another study in the new mould Halliday (1975) discusses "language" learning in infancy, prior to the acquisition of adult words. In his view the infant begins from early infancy onward to use vocal sounds consistently and systematically, developing some kind of constant relation between sound and meaning. The infant's meanings can be understood if it is recognized that the child has certain goals which he realizes through vocalizations. "He uses his voice to order people about, to get them to do things for him; he uses it to demand certain objects or services; he uses it to make contact with people, to feel close to them; and so on. *All these are meaningful actions*".

Halliday has investigated the language development of one child (Nigel) from about 9 months onwards. He offers not a "grammar" but a series of "descriptions" of this child's speech. He proposes that the child's language is a two-level system consisting of a content (meaning) and an expression (sound). Each element in the system is made up of a meaning and a sound. The adult system, by comparison, is a three-level system, including a lexicogrammatical stratum (vocabulary and grammar) intermediate between the meanings and the sounds.

One question that Halliday faced was that of developing criteria for accepting anything as an element in the child's system. One requirement was that of *systematicity*, that is, there had to be "a constant relationship between content and expression." An illustration is that whenever Nigel says nananana it always means something like "I want that thing now," and whenever he expresses the meaning "I want that thing now", he always does so by saying nananana. This meaning-sound relation can therefore be considered as part of the language. The second requirement was that of functionality. The child's vocalizations were required to be both systematic and functional. The meaning "I want that thing now" derives from one of the set of original developmental functions from which the child starts, namely the instrumental function, the use of language to satisfy the child's material needs.

Halliday is intent upon making a bridge between the language that the child creates for himself at the very first stage and the adult language that he comes out with at the end. He does this by postulating certain broad functions of language in social life. The adult's language is multifunctional, and is structured around the two-way distinction of ideational* (representational, referential, cognitive, denotative) and interpersonal** (expressive-conative, orectic, evocative, connotative) functions of speech. The primary question that Halliday poses is: How does the child progress from his own functional system to that of the adult? To answer such a question demands that we try to discover those functional contexts of language use that are likely to be critical for the child. He provides a set of functions which he believes will serve for the interpretation of language of a very young child:

(1) Instrumental: function that language serves so as to enable the child to obtain the goods and services he wants. (I want that object there);

(2) Regulatory: functions to enable child to exert control over others' behaviours. (Do that again: Let's do ...);

(3) Interactional: language used by child to maintain contact with those around him. (Hello: Pleased to see you, etc.);

(4) Personal: used to express the child's own uniqueness, individuality, and self-awareness, e.g., expressions of personal feelings (That's my ...);

(5) Heuristic: exploration of environment, demand for a name (which is the child's way of categorizing the objects of physical world (What's that called?));

(6) Imaginative: language used to create a universe of one's own (Let's present ...);

(7) Informative function: language used to communicate information to someone who does not already possess that information. (This is a late developing function beginning at 22 months in Nigel.)

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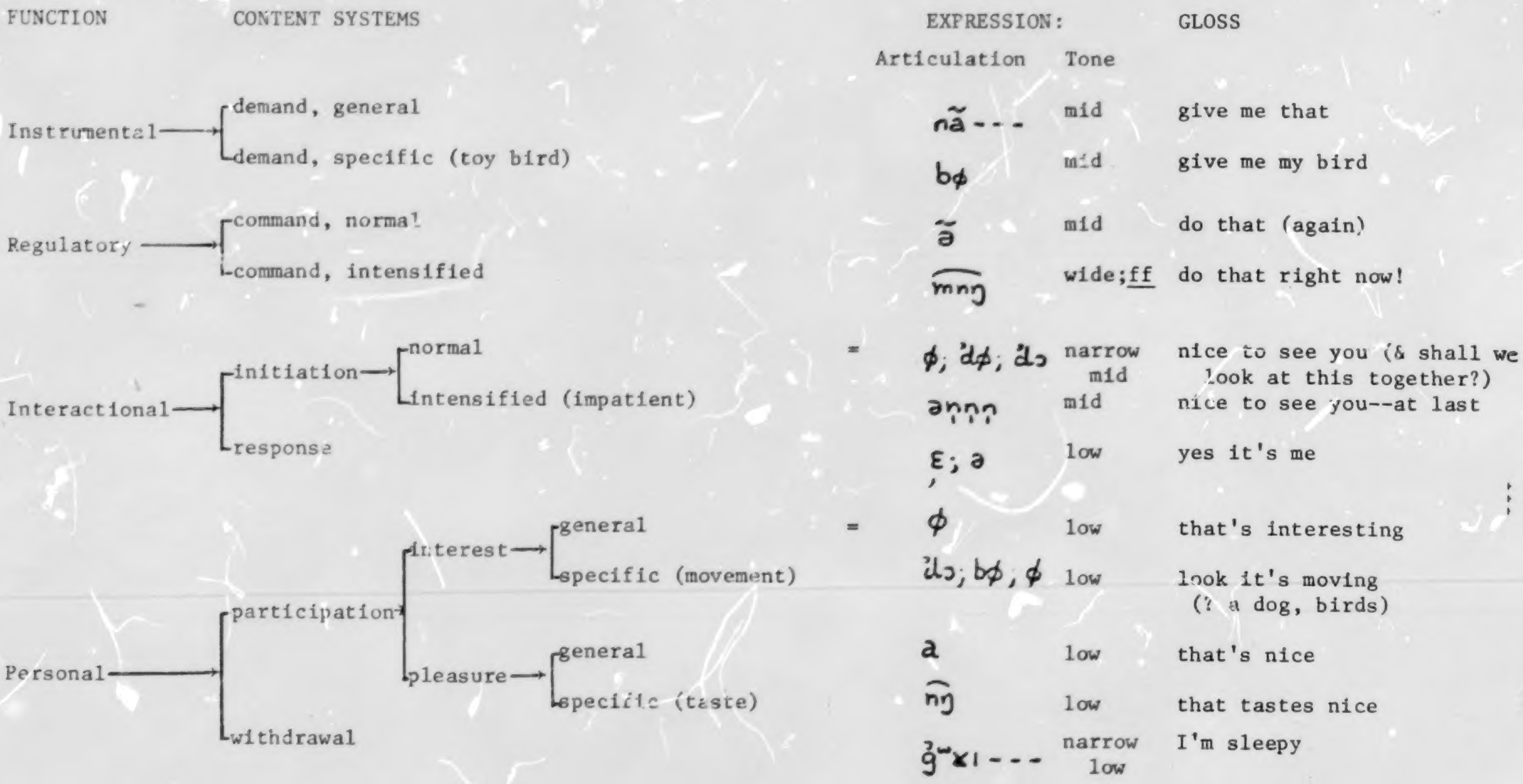
*Language as a means of talking about the real world.

**Language as a means of expressing individual personality.



| FUNCTION | CONTENT SYSTEMS | EXPRESSION: Articulation | Tone | GLOSS |
|---|---|---|---|---|
| Instrumental | demand, general | nã - - - | mid | give me that |
| | demand, specific (toy bird) | bø | mid | give me my bird |
| Regulatory | command, normal | ə̃ | mid | do that (again) |
| | command, intensified | m͡nŋ | wide; ff | do that right now! |
| Interactional | initiation → normal | = ø; ˀdø; ˀdɔ | narrow mid | nice to see you (& shall we look at this together?) |
| | initiation → intensified (impatient) | ənnn | mid | nice to see you--at last |
| | response | ɛ; ə | low | yes it's me |
| Personal | participation → interest → general | = ø | low | that's interesting |
| | participation → interest → specific (movement) | ˀdɔ; bø; ø | low | look it's moving (? a dog, birds) |
| | participation → pleasure → general | a | low | that's nice |
| | participation → pleasure → specific (taste) | n͡ŋ | low | that tastes nice |
| | withdrawal | g̃ˀxɪ - - - | narrow low | I'm sleepy |

Figure 1. NL: Nigel at 0;9 - 0;10½

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From M.A.K. Halliday, Learning How to Mean, London: Arnold, 1975.

At 10½ months Nigel uses his vocal resources in *four* of the seven functions mentioned. In the instrumental function he has one utterance which is a general demand, meaning something like "Give me that" and referring always to some object which is clearly specified in the environment. This contrasts with the specific demand for a favourite object, in this case a toy bird. The total system of the child at this stage comprises a very small set of distinct meanings, in fact 12 meanings. Figure 1 is an account of Nigel's complete vocal communicative repertoire at 10½ months. At this time each utterance has a single function only.

Where do these sound sequences come from? With the exception of bø (bird), which may well be an imitation, all the other sequences seem to be spontaneous reactions of what Halliday calls the *glossogenic* process. The same observation can be made about the content of the child's early systems. It is not, in general, derived from the meanings of the adult language. Eventually the child's system has to converge on the adult system, and in Halliday's data it is possible to see how the functional meanings that Nigel expresses gradually come to look more and more like the meanings that are encoded in the adult language.

Here is an example of the way in which the meanings that the child expresses do not correspond exactly to the meanings of the adult language. At NL3 (1 yr. - 1.1½ yrs.) if Nigel is asked whether he wants a particular object to be given to him, and he does want it, he answers *yi yi yi yi* = "Yes, I want that." He also has another form, viz. *a*: which means something like "Yes, I want you to do what you have just offered to do", as a response to questions beginning "Shall I ...?" The child is responding differently to whether an object is *present*, or whether a *service* is being offered.

The child's meaning potential develops from an initial point (NL1) where he is able to express 12 distinct meanings to one (NL5) where the number of meanings is around 50.

NL5 (1.3 - 1.4½ years) represents the final stage of Phase 1 of the child's language development, wherein the child develops a *protolanguage* of his own. From now on, the child begins the transition to the adult system. In NL5 there are many recognizable forms of English, but the opening up of *new* functional meanings is also going on. At 16½ months the child asks (a, $d^y$, da) "What's that (called)?"; the answer was *that's an egg*. The child imitates *egg* (ayi:) repeating the sound a considerable number of times. Shortly afterwards, the child sees the egg, or a picture of it, and produces the same sounds. After a further interval he uses the same sound *without the stimulus being present*, but in terms of one of the functions for which he uses language, for example, in the instrumental meaning of "I want an egg." Then, when he starts to engage in *dialogue* proper (at 17½ months) the word is used where the function is no longer obviously interpretable in the earlier terms. *Mother*: Did you tell Daddy what you had for tea? *Nigel*: $a^{y}i$ ... o ... $a^{y}i$ ... $a^{y}i$ (egg, ooh! egg, egg!).

Brown (1973) is interested in the grammatical development of the child, and explores the nature of the child's knowledge of his language at different stages of development. In his book *A first language: The early stages*, Brown analyzes the child's language acquisition in the first two years, and discovers that the child's major tasks consist of acquiring the *basic semantic operations and relations* and the means by which these meanings can be modulated.

In his study of the 3 children Adam, Eve, and Sarah, Brown finds that about 75% of their sentences express the following 9 semantic operations and relations:

*Three Operations of Reference*

(1) *Nomination* - a pointer word plus some referent physically present: *That dog* or *See book*;

(2) *Nonexistence* - comment on the disappearance of some referent or its failure to appear: *Dog all gone* or *No more dog*;

(3) *Recurrence* - comment on, or request for, the reappearance of a referent: *More swing* or *Another cookie*;

*Six Relations*

(4) *Location* - putting together the name of a movable object and its locus: *Sweater chair* or *Pencil cup*;

(5) *Possession* - a primitive sense of property and territory: *Mommy dress* or *Daddy chair*;

(6) *Attribution* - specifying a referent and the value of some attribute: *Yellow truck* or *Big book*;

(7) *Agent-action* - *Daddy write* or *Mommy come*;

(8) *Action-object* - *Hit ball* or *Change diaper*;

(9) *Agent-object* - the initiation of an action and its recipient distinguished from possession by context: *Mommy sock* or *Daddy suitcase*.

To Brown, the child at Stage 1 (approximately the first two years) not only has in mind certain elements but also intends a definite structural relationship among them. The evidence for this view is that the child's words are in part produced in a particular order and it is almost always appropriate to the relation suggested by the non-linguistic setting.

Many of the above examples of child speech would not usually be used by an adult. What is missing from the child's sentences at this stage of development are the grammatical morphemes, e.g., articles, prepositions, conjunctions, auxiliary words, inflections, and affixes. These express subtle modulations of meaning. The grammatical morphemes are acquired (at least in Brown's trio) during the third and fourth years.

Brown has considered the role of various possible determinants in the child's acquisition of adult forms of the language; these include:

(a) Frequency
(b) Perceptual salience
(c) Complexity - both semantic and grammatical
(d) Parental reinforcement

(a) By "frequency", Brown means how often the structure appears in parental speech. Whereas it is certainly the case that children will not learn constructions they never hear, Brown's evidence suggests only a marginal role for frequency. He found that the correlations between parental frequencies for each grammatical morpheme and its acquisition by the child are of a low, non-significant order.

(b) By "perceptual salience", Brown means amount of phonetic substance (plural "s" vs. "ing" form) stress level, usual position in a sentence, etc. Where again it is obviously the case that the child will not learn what he cannot hear, it is not yet clear how perceptual salience may affect the child's language acquisition.

(c) Brown argues that "complexity" is a significant variable in determining the child's acquisition of a particular structure. Essentially his view is that a construction x + y may be regarded as more complex than either x or y because it involves everything included in either of the constructions plus something else. So a sentence which includes agent-action-object is more complex than one comprising either pair of relations separately.

(d) "Parental reinforcement": Brown discovered that whereas parents do speak more simply to children than they do to adults, parents generally do not reward or punish the child for nongrammatical sequences, e.g., "She goed", or "All gone Daddy". Parents seem only to correct speech which is factually incorrect, e.g., "Tomorrow is Tuesday" (when it should be Wednesday), or where the child has spoken impolitely, or has otherwise contravened a sociolinguistic rule. Parents, at least in Brown's data, do expand the child's speech but present evidence does not show a clear role for parental "training".

The principal change in the study of child language in the 1970's is that researchers have begun to relate their work to the rest of cognitive psychology, so that the basic questions now being raised concern what the child knows about language, and how his knowledge has come about.

Research in education is being influenced by the new wave of research and theorising in cognitive psychology. For example, language is beginning to be viewed as a sensitive indicator of a student's knowledge, and new directions in educational research include studies of the processes relating to the negotiation of information and to the definition of what forms "acceptable" knowledge take in the classroom, seen through analyses of the language interchanges of teachers and students. A basic presupposition in this work is that the individual student in the classroom (like the child acquiring language) is not completely shaped and blended by external social agents, but is instead active in the forging of his own systems of knowledge. The changes in the study of child language are offering useful parallels for the educational researcher's analysis of the student's cognitive processes. The questions posed by psycholinguists and sociolinguists relating to a child's knowledge of language are now beginning to be asked by educational researchers about school knowledge, e.g., "What does a child 'know' when he 'knows' elementary mathematics?" In child language and in educational research we are becoming aware of what questions should be asked. That always represents real progress in a discipline.

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# EDUCATIONAL FUTUROLOGY AND THE POTENTIAL OF AN INTEGRATIVE EDUCATION

Hugh Munby

## I

All of us who have participated in this series of colloquia probably cannot have failed to notice the range and depth of each of the separate disciplines and areas of inquiry which have been discussed. To mention a few, we have heard witness to the vast growth of scientific and mathematical knowledge and its consequences to modern society, and we have seen not only the richness of English literature's attempts to portray our psychological reality, but also the deep conversations about which ways are appropriate for interpreting the writer's craft. While alone each colloquium has borne testimony to the excitement, complexity, and significance of each discipline's intellectual pursuit, I am confident that these presentations prompt rather serious questions for all of us who are in some or other fashion committed to education. To put it succinctly, the proliferation of knowledge and sub-specializations within new and more traditional disciplines makes more vexing the question of what ought to be selected from such an array for inclusion in the educational experiences of our youth.

Rightly or wrongly, I see my task today as addressing that question, not because it has to be addressed (it always has), nor necessarily because I am supposed to be a curriculum theorist (an odd job, incidentally, and I'll speak more to that directly), but mostly because I believe that the wedded notions of an image of the whole and integrative education offer a line of inquiry which holds some promise for addressing the question. So what I want to do, and I need to be very clear about this, is to argue that integrative education provides a potentially useful way of at least viewing the puzzle. I am not advocating a panacea which demands total adoption of a curriculum based upon so-called integrative principles. Instead, I shall suggest that for certain educational goals, such a curriculum may be, among others as yet undiscovered or unknown, an engaging candidate.

In the course of making my argument, I will explicate these goals and describe as clearly as I am able what integrative principles are and how they might serve as a conceptual framework for a curriculum. Before I get too far, I must indulge in some disclaimers which may help to focus attention on the thrust of what I wish to say. First, I wish to disclaim any connection between a curriculum theorist and a curriculum theory, for the simple reason that there is no set of statements about curriculum which might qualify as a curriculum theory, in the way that some sets of statements qualify as historical theory or scientific theory, and so on. The task of a curriculum theorist is essentially one of knowing how to select and selecting from among the theoretical propositions of relevant disciplines and, assuming that problems of conceptual clarity are achieved, ordering these propositions in a practical argument about an educational phenomenon or problem. So, curriculum theorists will struggle with educational aims, limitations of objectives, various teaching strategies and a host of similar matters which require sustained practical reasoning. (As we will see, this curriculum theorist also deals in the limitations of empirical methodologies for asking educational questions.)

My next disclaimer circumscribes my argument by asserting that what is of immediate import is what is to go on in the curriculum, rather than where it occurs. This is not to say that I am unconcerned for the institution of school, but it is to say that arguments about what is taught properly take temporal precedence here over arguments about the situations in which teaching will take place.

My final disclaimer honors the very obvious limits of an integrative education like the one I am to discuss here. Specifically, I am here not concerned for vocational or professional education. If integrative education has a place, it is in what can be called general education--the educational experiences to which all should be exposed. The basic assumption, then, is that a significant case for a disciplinary knowledge base in the curriculum exists independently of the professional and vocational expectations that might be had of a curriculum.

## II

The search for bases upon which one might erect a curriculum that provides youth with an image of the whole is not inappropriately joined by examining curriculum literature that sets out to speak to future education. On the face of it, that seems reasonable enough. But, as I shall show, a search here can be quite disappointing. Nevertheless, for at least two reasons, this search is important to our present task. First, as with previous participants in this series, it is incumbent upon me to give some account of the state of the art in the area under discussion: in this case, the products of curriculum theorists' deliberations on educational content for the later part of this century, if not for some of the next. Second, and possibly more intriguing, this search reveals a feature of current educational inquiry which I believe to be detrimental to the very notion that educational inquiry is both a scholarly and practical pursuit. Simply put, the feature is an emphasis upon process, as opposed to product, with little heed given to the quality of ideas that such processes might yield. We'll bear this thought in mind as we survey some of education's futurology.

A recent and bulky venture into education's future can be found in Learning to Be, the Unesco report, which is commonly referred to as the Faure Report after the chairman of the commission (Faure, 1972). While much useful information is displayed here, elements of curriculum arguments about aims are rather meagre, in my judgment. The section on goals, for instance, (pages 146-159) exhorts us with minimum foundation toward a scientific humanism, a quest for new values (though it is noteworthy that nothing is said of which values), democracy (as ever), the complete man, and creativity. We find that a learning society is envisaged, yet the propositions purporting to capture this are process propositions: "Educational institutions and means must be multiplied and made more accessible" (p. 183). "Education should be dispensed and acquired through a multiplicity of means" (p. 185). Even talk of the content of education is in process language: "The concept of general education must be markedly broadened, so that it definitely includes general socio-economic, technical and practical knowledge" (p. 194). The eleven lines which follow this statement give little explication of what is involved in the concept and its markedly broadened cousin.

Another glimpse of what is in store is provided by Torsten Husen in Present Trends and Future Developments in Education: A European Perspective (1971). Husen predicts that economic growth will offer opportunities for increased consumption, that the process of change will accelerate in the manufacture of goods and the provision of services, and that the accelerating flow of information will result in a marked increase in the influence of experts, an increase in pluralism of values and life outlooks, and an increasing difficulty to maintain a balance between the ecological system and technology. Accordingly, we are urged, education should instill a receptivity to change, while all that is suggested for coping with increasing knowledge and meritocracy is a facility with communication skills. Most of Husen's ensuing comments focus upon finance, open schools, educability, and individualized instruction. The learning society is offered up again, but what such an organism is meant to learn is left unannounced.

Other sorts of innovation are projected by Harold Shane (1971) in the NSSE yearbook, The Curriculum: Retrospect and Prospect. Using a technique called ORPHIC (Unorganized Projected Hypotheses for Innovations in Curriculum), which is similar to the Delphi technique, the following predictions were made in 1971: the perfection of memory-improving drugs in 1980, the availability of highly effective computer based instruction in 1982. We are not told what we should memorize nor what we should be instructed in using such technology.

Educators appear to have relied rather heavily upon the Delphi technique for future forecasting. As Baker (1971) of the Human Resources Commission of Alberta puts it, this technique sharpens the focus of our predictions. So it is not surprising that the predictions to 2005 of this commission are based upon this tool's use: we can expect to experience a decline in authoritarianism in education; and an emphasis placed upon creativity, environmental education, interpersonal relations, sex and marital education, and education for leisure (Dyck, 1970). We could, of course, season these predictions with the current "back to the basics" movements in Canada, and locally, with the resumption of curricular control by the Ministry of Education in Ontario. Interestingly, too, a recent study by Livingstone finds that Ontario residents expect increased emphasis to be placed upon job training and basic skills (Livingstone, 1976). If we perceive contradictions among the predictions of futures study in education, we should not be confused or dismayed. Here is one prediction about the left-right swing of authoritarianism in education:

> Everybody knows how largely systems of punishment have had to be reported to by educational systems which neglect present possibilities in behalf of preparation for a future. Then, in disgust with the harshness and impotency of this method, the pendulum swings to the opposite extreme, and the dose of information required against some later day is sugar-coated, so that pupils may be fooled into taking something which they do not care for.

These are the words, published in 1916, of John Dewey (1964, p.7). So, on the face of it, it looks as if future forecasting is contentious, and this is more apparent when we consider the deficiencies of its major tool, the Delphi Technique.

The principal claim of this technique, more minds are better than one, is achieved, as we know, by having respondents make a second (and sometimes a third) choice on the basis of knowledge about how the group responded initially. In a cogent critique of this method based on data obtained in studies using it, Weaver (1971) offers the observation that while respondents may revise their responses in the light of modal distribution, no significant changes are produced in subsequent rounds. Significant changes occur in the second round, only. He reports that those who do swing in their second response do not necessarily do so on the basis of sound judgment, but often for reasons of personality factors. One can imagine the influence of the peer group upon the individual who suffers from low tolerance for ambiguity. Weaver comments:

> The plausibility of the Delphi forecast as now construed can be argued only on the basis of expert consensus or argument. But consensus alone is not a sufficient condition for arguing that a forecast is plausible and convincing. It is not even a necessary condition. . . .
> . . . the meaning of any statement about the future will be manifested only in what the statement convinces us the future can be made to be through reasonable actions, not in what it will be.
>
> (177)

The upshot of all this is not very complex. Predications about the future's demands upon the curriculum are not very substantive, neither do they seem at all reliable. Yet it is worth fastening on to a few points which have emanated from the foregoing search. First, as forewarned, we see in this educational inquiry a fascination for process--not just on forecasting the future, but in the forecasts themselves. Largely, the language of these predictions speaks either to technique and technology, or to curriculum aimed at developing techniques: coping with change, dealing with leisure time, managing in and out of wedlock. Next, we must acknowledge that, if any of these predictions eventuate, there is not very much in the curriculum prescriptions into which a curriculum theorist or designer can sink his teeth. I don't think it too bold to suggest that we have at present the capability to design curricula for a number of technique, skill, and process objectives. Whether or not such things constitute an education is of course rather a difficult question, one which brings us directly to the last point from this search. It is this: there is something missing from all these accounts of the future's educational aims, and that is what our youngsters will need to know, in the propositional sense of knowledge. I could very easily be mistaken, but it seems to me that the question of the place of disciplinary knowledge in the curriculum is not well answered by future projections, but can be better assessed by reflection on the knowledge that we have now. And that is the way I wish to proceed with the question here.

## III

A number of difficulties accompany the task of considering the place and type of propositional knowledge in the curriculum. One is that the spread is so vast that it seems to defy sane choice. Another might lie in the recognition that lots of knowledge may itself have little use, while some that was once useful has fallen into disuse. (Of course, deciding what constitutes use and disuse is a sizeable problem in its own right.) I will take a brief look at a recent account of knowledge in the curriculum to illustrate some of these points. To my mind an account by Broudy (1976) is typical of work in the philosophy of education which proposes that several forms of knowledge must be taught. (Hirst (1973) and Peters (1965) make similar cases.) Broudy offers the following: (1) symbolic skills and symbol systems for encoding and decoding information; (2) basic concepts of the key sciences; (3) evolutionary patterns of the cosmos, the social institutions, and the technologies of culture; and (4) great exemplars in the arts and the humanities that depict the crucial points of development in the value systems of the culture. I am not suggesting that I am in disagreement with Broudy, I just want to make the point that we still have to ask how we are to decide which concepts are basic in the key sciences, which accounts of evolutionary patterns are significant for learners now and in the future, and which exemplars in the arts and humanities are great.

A development of this approach may be found in the work of those, such as Schwab (1964), who argue the significance of revealing the structure of the discipline in a curriculum. Hence we see in the early sixties a wave of curriculum materials in mathematics and natural and social sciences which give information about how disciplines function. In some instances, it is clear that the philosophy of the discipline has been quite influential. Now, though, this approach has dwindled, and become the "process oriented" curriculum which, by any standards, is a pale epistemological shadow of its former self. (The emphasis shifts to saying we will teach youngsters how to think in science, say. By which is meant we will teach observation, data collection, hypothesis formation, prediction, and so forth. This is certainly not peculiar to any one discipline, but rather reduces to saying we are going to teach youngsters something about the way our language functions in the generation of rational argument.)

Despite these efforts I am still not wholly satisfied that the potential of a knowledge-based curriculum has been fully explored or exploited. To make my uncertainty clear, I am afraid that I will have to distinguish very loosely two different types or levels of knowledge: surface information, and a deeper (which means less accessible and less readily articulated) set of propositions.

I find a little introspection to be of help here. If we consider briefly our own knowledge, we come to recognize that little of it is of the sort we gathered from teachers, textbooks and the media--little is surface information. Rather, what we walk around with consists, as it were, of a highly complex set of articulated or unarticulated propositions which might be construed as summing to an integrated view of our world. Or, to coin a phrase, we can think of ourselves as each possessing a unique and conceptually rich image of the whole. Of course, there is nothing particularly novel in this notion (and I certainly don't wish to be thought as assuming credit for it); indeed, many of our disciplines have made it their business to describe this general condition in their own distinctive ways. Bowers (1971), for example, as an existentialist, is obviously pointing in the same direction when he speaks of conceptual matrices, as follows:

> The conceptual matrices the student acquires in school as well as those already acquired elsewhere but reinforced in school, determine how he will organize and give meaning to phenomena he perceives. . . . Because we use these conceptual matrices to explain, order and give meaning to our lives, we generally do not realize that they are relative to our particular culture.
>
> (23)

Bowers offers the ideas we have of work, time, space, and causality, which we tend to reify, as components of these conceptual matrices. Certainly, our knowledge of them is not passed on explicitly in school; they lie deeper than that. The knowledge we glean from explicit statements in school lies on top of these ideas; it is surface information. So, while ideas such as those identified by Bowers receive no explicit attention, they are passed on implicitly beneath the surface information.

Polanyi's view of tacit knowledge may be similar to the conceptual image of the whole, but I am not confident that I understand Polanyi (1958) well enough to judge that. Certainly, Kuhn's (1962) concept of paradigm in the history of science, though somewhat vague in places, appears to be speaking to a similar point. This leads us to recognize that the conceptual image of the whole which each of us has developed is not entirely private. As sociologists and anthropologists have shown, there are commonalities among our matrices which appear to lend substance to the very concept of culture. (Marx and Weber recognized this many years ago.) And, while I will not pursue it here, given the significant relationship between any culture and its knowledge, we can expect the sociologists of knowledge to have important information for the curriculum theorist on this point.

I admit that I'm using mentalistic language when I speak of an individual's conceptual image of the whole (and I don't intend to reify this concept), yet it is worth noting that while the language and practice differ, I am in good company, for philosophy and psychology do the same. After all, what else can we employ, when we wish to draw attention to concepts like these? But this is thin justification, though. Better would be a demonstration that this way of talking is useful to a curriculum theorist, and I submit that it is, basing my belief in part upon the work of other disciplines which treat both levels of knowledge: the surface and the deep. At the same time, I think we need to admit that our explanations of how such deep knowledge, such as time and causality (which might comprise our conceptual image of the whole) arises are woefully embryonic. All the same, there seems to be something important here, and it won't harm to push and stretch the idea, and then to see what service it can be to the curriculum theorist. When this is done, I find the idea of a conceptual image of the whole potentially useful for two different sorts of reasons which I'll label reasons of educational purpose, and reasons of conceptual economy.

Reasons of educational purpose go somewhat as follows. The notion of a conceptual image of the whole implies that our perceptions and surface knowledge are steeped in a different form of knowledge which is metaphysical and which consists largely in assumptions of which we are generally unaware. Accordingly, if education implies a commitment to rationality, it itself implies a commitment to laying bare for our students as much of this metaphysical knowledge as we can. A failure to do this might constitute an attempt to mislead and to being less than rational about the supposedly fundamental bases of our knowledge. We are simply not disclosing all that we believe we know about what we believe we know. So reasons of educational purpose are contained within the realization that we possess and are controlled by our conceptual image of the whole, or our conceptual matrices, whichever way we wish to speak of these things.

Reasons of conceptual economy take us back to future forecasting, and the awesome problem of how a knowledge-based curriculum is to be built from selections of the knowledge available in various disciplines. Where educational future forecasting is largely absurdly uncertain, it does seem apparent that the amount of information and the proliferation of disciplines are both increasing. Yet the problem of selection may be eased if we can characterize our knowledge in statements about a conceptual image of the whole, which give ready access to how disciplines work and to the major concepts which are either embedded in the disciplines or control other concepts of the disciplines. Such an approach would be conceptually economic, for one can comprehend more with fewer concepts. It is at this point that what have come to be known as integrative principles enter the curriculum theorists' field of view, and I will sketch some of these before I consider briefly the issue of their potential for an integrative education.

## IV

The search for integrative principles was initiated in the 1930's by a small group of scholars who shared an interest in determining if western knowledge (and eastern knowledge) despite its disciplinary fragmentation possessed a basic and metaphysical conceptual unity. This search was encouraged by the institution of the Center for Integrative Education in New York City, and by its journal, Main Currents in Modern Thought, started in 1942 under the leadership of Fritz Kunz and Benjamin Lee Whorf. It is of course impossible to do justice here to the profundity of thought appearing in that publication over the years, but let me attempt a short résumé. The claim is made that an examination of the more stable concepts used in disciplines reveals common features: that is, at a relatively high level of abstraction concepts having common meanings and intents can be discerned, although they are differently described. These concepts are labelled integrative principles. The search for such commonplaces is by no means complete, yet I think the examples which follow illustrate the general usefulness of this approach toward integrating our knowledge (and our understanding of it) at a level similar to that occupied by our conceptual image of the whole. The descriptions below are from a chapter by Alastair Taylor (1972) in Integrative Principles of Modern Thought and from the work of the Canadian Centre for Integrative Education.

There are three sets of principles: individual constructs, principles of regulation, and epistemological principles. First, individual constructs which, like the conceptual matrices of Bowers are consistently employed in our efforts to portray reality: space, time, motion, energy, and boundary. The force of these constructs may vary slightly from one discipline or area of knowledge to another. For instance, their articulation in physics will be slightly unlike their appearance in psychology or in the arts and forms of artistic criticism. Yet, a moment's reflection shows that the concepts themselves are as central to our society, institutions, culture, and politics as they are to the study of these phenomena.

The next set of principles, those of regulation, appear to govern our ways of constructing reality. Just to give you a flavour of these principles, let me describe two: equilibration and isomorphism. Equilibration, the concept of balance essentially, is so pervasive that it seems that we construct our reality to match this idea, whether the equilibrium is static or dynamic. What Le Châtelier did for equilibrium in chemical reaction kinetics, Piaget did for equilibration between the child's conceptual schemata and elements of the environment. So also we conceive of health in a living organism as a balance, controlled by homeostasis. The concept figures in our speech about economics, politics, and power, as much as it does in our discussions of the creative arts.

Isomorphism, in a non-mathematical and non-technical sense, calls into mind the fashion in which we use, for example, physical models of our invention as conceptual models for explaining organismic behaviours. Some instances of our dependence upon isomorphism in our thinking are found in simple (and sometimes silly) analogies: the telephone switchboard or the computer analogues of brain function. Perhaps the clearest example of isomorphism in use is the employment of general system theory itself. Establishing the analogue, and assuming a one-to-one correspondence between it and what it is meant to model are rather basic processes in our theorizing.

The final set of integrative principles, epistemological principles, have to do more with how we perceive. Three of these can be mentioned now: figure-ground, form-function, and what Henry Margenau has called P-plane/C-field.

The operativity of the figure-ground principle is not simply a reflection on Gestalt psychology--we are familiar with the hidden figures, which themselves provide interesting points about the way we perceive. This principle attempts to capture how, when we don the spectacles of a particular discipline, we focus upon that part of the phenomenal world which the discipline can address, while we allow the remainder to recede into the ground. Both the psychology of perception and the syntactic structure of our disciplines would tend to point to our use of this principle. (The latter, in part, proscribes the phenomenal world that can be addressed by the discipline in question.)

The form-function character of our knowledge is not restricted to ways we look at living things, biological or social. An example will show that it is buried deeply in how we think. When Don Juan and Charles Castaneda are discussing "flying" after taking a prescribed portion of the Devil's Weed, Castaneda attempts to discover if he 'really flew", that is, did he fly like a bird. Don Juan doesn't suffer this form of questioning too patiently; and to the inquiry ". . . did my body fly? Did I take off like a bird?", he responds:

> You always ask me questions I cannot answer. You flew. That is what the second portion of the devil's weed is for. As you take more of it, you will learn how to fly perfectly. It is not a simple matter. A man flies with the help of the second portion of the devil's weed. But that is all I can tell you. What you want to know makes no sense. Birds fly like birds and a man who has taken the devil's weed flies as such.
>
> Castaneda, 1968 (pp. 130-131)

For us, the function of flying is associated with the form of wing, and any other way of looking at it is literally inconceivable. Don Juan conceives it differently and evidently finds it mystifying that Castaneda doesn't understand. (The cultural relativity of our conceptual image of the whole is plainly seen here.)

I find the P-plane/C-field principle both simple and confusing. In a fashion it is instrumentalist: it shows that we construct our world with constructs (the C-field) out of protocol data occurring in the P-plane. The principle coincides quite well with epistemological theory, and serves to caution us against the reification and even deification of the constructs we invent--including integrative principles and conceptual images of the whole. Even so, there is a fundamental duality here which is more than mildly dissatisfying. Yet, the force of the principle remains: that whatever our knowledge, the way we come by it perceptually and conceptually will be the same for all disciplines.

That is probably a sufficient account for the present, and it does bring me rather close to the boundary between my knowledge and my ignorance of integrative principles. So, I will briefly restate the premise of an integrative education based upon these principles, pose some questions which I think are important, and bring my remarks to an end.

## V

The thrust of integrative education, as I have described it here, is founded upon the belief that integrative principles such as those just mentioned can be employed as a conceptual base or core of the portion of the curriculum which exposes the learner to disciplinary knowledge. In this way, learners can be provided with the fundamentals of our western way of knowing in an abbreviated yet rich way, so that they can better or more easily understand developments in our knowledge. Additionally, the character of the integrative principles themselves suggests that learning about them will give the learner insight to the origin and nature of available cultural knowledge. In a way, we can see that such a curriculum might go a great distance toward exposing to learners the shared and objective conceptual image of the whole.

Questions about what such a curriculum would look like, and how it might be taught need not concern us at present, for there are many more urgent questions in wait of answers. Among these might be the following:

1. What precisely is the character of these integrative principles? In what sense do they reflect on our many disciplines and ways of knowing?
2. What other principles might be found to complete a conceptual image of the whole--a public image, that is?
3. Are these principles indeed fundamental to our way of thinking, and thus to our constructed reality?
4. Does a search for our conceptual image of the whole involve us in an infinite regression? That is, even if we can identify, write out and talk about these integrative principles and a resulting conceptual image of the whole, are we not still identifying, writing out, and talking about them through yet a higher order of conceptual matrices, which similarly might be identified, written out, and talked about?
5. Is the depiction of our knowledge according to a small number of integrative principles going to provide a coherent and comprehensive base for the disciplinary-knowledge component of the curriculum?
6. Does such an approach provide conceptual economy, or is it possible to approach our ways of knowing integratively only after we have sampled each separately?
7. Is an integrative education possible? That is, can integrative ways of looking at the world be taught, or do we

just come across them regardless of our formal education, thus offering further testimony to our resilience?

There are many other questions, of course, But we must recognize that the number of questions which can be posed at this time in no way limits the potential of integrative education as it is described here. (Similar questions could and should be asked of any approach to curriculum, present or future.) Limiting the potential is the business of answers, not questions.

## VI

I should like to add a rather more personal thought in the form of an afterword. With some horror, I realized as I approached the writing of this that I began my involvement in the study of education just about ten years ago. From that time to this, I have been engaged in examining a wide range of phenomena and theory which is either educational or closely related to education. I cannot say with any confidence that I have learned very much from this involvement, except perhaps to be able to discriminate between trivial problems and significant ones, and to assert firmly that education as a profession and as a field of inquiry is in the midst of crisis, for both are beset by problems of great consequence. We do not know how people think, we do not know how people talk, we do not know what constitutes knowledge in a discipline when people speak knowledge, and we are uncertain if teaching involves speaking knowledge or something more, and even then, how we learn is beyond our comprehension. True we are not in lack of theories about these, but the theories compete with slim evidence, and all of this within a context of profound uncertainty about what an adequate theory should be like in order to qualify as a premise within an argument prescribing what we should do to people. So we are rather schizophrenic in this Faculty. The right hand legitimizes students as teachers and teachers as masters of education, while the left hand asks why and how and looks on in bewilderment.

What I wished to do when I started this paper was to share something general about the state of curriculum theorizing, and to point to integrative education as a potentially helpful line of inquiry. I myself am not committed to integrative education nor to the integrative principles implied. I like to think that my commitment as a curriculum theorist is to rationality. I happen to think that at this early stage, this particular conceptualization for curriculum is too embryonic to warrant judgment. But I also happen to think that it merits careful and considered scrutiny.

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# HOLISTIC KNOWLEDGE
# AND THE POLITICS OF FRAGMENTATION

Rob Walker

In this paper I propose to tentatively impose some order on what has been said in preceding sessions, and perhaps to do little more than remind you of what you already know. My intention is to focus on what seem to me to be some very important general questions which need to be confronted before we can get very far with any concept of integrative education. You may find such questions to be rather too general, too abstract. For that I apologize. In any case I hope we can get down to more specific issues in a more "integrative" dialogue format. In the process, I hope to give a few indications of the kinds of very basic assumptions which have generated the movement that has come to be known as integrative education.

Perhaps I should begin by admitting, and indeed emphasizing, the enormity of the problem. The variety and complexity of the issues involved add up to one of the most difficult intellectual and social challenges of the latter part of this century. I confess that it is only a repeated feeling of anger and frustration at the banality of what passes for knowledge and education in our time that maintains my interest in, and enthusiasm for, attempts to deal with this problem. For to talk of integrative education is not to talk simply of interdisciplinary education, in which it is assumed that a group of specialists, all bred upon different traditions and assumptions, might hope to say something about complex and general phenomena. It is not just a better way of solving particular problems which transcend traditional disciplinary categories. Nor is it merely an educational problem which can be considered outside of any wider intellectual, historical, or social context. Indeed, therein lies the nature of the issues I wish to emphasize. Perhaps it is not even anything new, unless our historical consciousness is of the kind that regards anything written before this century as mere stepping stones to the glories of our modern sophisticated technological world.

To think of integrative education at all in fact presupposes some kind of philosophy of history, one which views our time as an age of rather profound crisis. Now many people see many different kinds of crisis around us. Perhaps we are concerned with some crisis of Western civilization, or of capitalism, or of ecological exploitation and the "limits to growth," of our lack of control of the technological monolith, or the increasing gap between rich and poor. Or perhaps we are concerned with the materialization of values, with rampant nihilism, consumerism, or technological rationality. Everyone has their own favourite, and I do not need to emphasize the immense scale of each of them. Integrative education is not something which will concern those whose only conception of a crisis is an inability to purchase more and more consumer goods, or the scarcity of people who can write good bureaucratic English. It may, however, be necessary to remind ourselves of the interrelationships between these different areas of modern life, and to stop viewing the world in terms of our own pet problem.

To put this more succinctly, my starting point is that problems of education may be viewed as symptoms of much wider problems. And the most telling symptom from the point of view of integrative education is the fragmentation of knowledge, the Humpty-Dumpty world, a world which has been divided and mastered, but which we now find impossible to put together again in any meaningful way.

Now many people I know are content to see this fragmentation of knowledge as a natural human condition, a necessary legacy, perhaps, of having eaten at the tree of knowledge. Many self-styled pragmatists and realists (in the common meaning of these terms) thus tend to look upon attempts to view the fragmentation of knowledge in any wider context with scepticism--as Renaissance man over-reaching himself, or as an attempt to develop some esoteric "glass bead game." One may after all admit, and even be thankful, that no one view of man has ever won universal acceptance. Frankly I have some attachment to this position. I value diversity as much as I do unity. I have sympathy for those who, while recognizing that education might, in a utopian situation, have something to do with conveying a sense of wonder about the world, have to spend all their energy just to help people to "cope" with the so-called real world. Sympathy, but no more. For I think it is a mistake to see education only in those terms. It leaves open what is meant by "to cope"; whether it implies fitting someone into a convenient slot in an alienating system, or to cope with oneself, to recognize one's basic human integrity.

In listening to the commentators in this symposium series talk about what they feel has been going on in their various fields, I have been struck by the repetition of issues which become defined in terms of polarities. The most famous issue of course if the old dichotomy between the arts and sciences. But we may also think of the repeatedly emphasized need to consider both the emotional, or intuitive. and the intellectual or formal components of aesthetic expression. Or the recurring debates about objective and subjective factors in the development of science. Or the way in which different disciplines have oscillated between empirical and theoretical orientations.

In my own field, discussion of these all-pervasive issues looms very large. Much modern political and social thought has become almost obsessed with questions about the nature of knowledge, couched precisely in the form of such polarities. And, I would argue, this kind of pre-occupation offers an important clue about the problematic of integrative education. For the obsession with problems of knowledge in socio-political thought pertains not simply to questions of selecting some appropriate methodology. It relates more fundamentally to the way in which our social and political structures are permeated by, and indeed are even reifications of particular modes of knowledge. And discussions about the nature of science reflect the fact that, for better or worse, we live in a world which has been moulded in terms of our historical experience of science and its associated philosophies.

Many of the problems discussed in previous sessions, then, have been framed in terms of polarities. Many others have been framed in terms of what seem to me to be one half of a polarity. We regularly hear complaints about the sterility of naive empiricism or naive realism without much mention of the fact that these positions have idealist, instrumentalist, or rationalist counterparts. Or complaints about an over-emphasis on "theory" rather than "experience" in the early phases of a child's education, with little being said about the essential unity of theory and practice. Again, because of the difficulty of talking about art, we now recognize that we have often tended to propositionalize the appositional, to force things which cannot be categorized or verbalized into logical categories and inappropriate linguistic formulations. Mathematics, we hear, has lost its contact with any sense of wonder, and has become an instrumentalist tool, the epitome of analytic method, rather than also as a mode of synthesis. And the main point to be made here is that such problems are familiar in a variety of forms throughout the historical development of western thought. The western tradition has for the most part been predicated upon an assumption of dualism. It has assumed that the subject can be separated from the object. And as Ernst Cassirer (1963) once put it, it is within this basic dichotomy between subject and object that we must see the source of the problem of knowledge rather than its solution.

I mention Cassirer mainly to bring attention to one of the more important, though neglected, integrative thinkers of this century. But he also presents us with, indeed he starts from the standard neo-Kantian version of the development of Western thought. It is within this context that I believe integrative education can be most usefully understood. From the Kantian viewpoint, the essential problem was to repair the damage created by the way in which the great dualists--and I think in particular of Plato, Galileo, Descartes, and Kant himself--split the world into two. With this split came also what Bergson (1954) called the "law of two-fold frenzy"--characterized as "the imperative demand, forthcoming from each of the two tendencies as soon as it materialized by the splitting, to be pursued to the very end--as if there was an end!" Much of the thrust of integrative thought seems to me to be directed at various manifestations of this frenzy. It has been particularly concerned to deny the either/or mentality of Aristotelian logic which separates theory and practice, theoretical and empirical knowledge, science from art, the logic of refutation from the intuition of conjecture, mathematical precision from empirical contingency, and so on. Most basically, it is concerned to deny the dichotomous separation of man from nature, the knowing subject from the object to be known. This dichotomy has formed the main characteristic, the historical teleology as Edmund Husserl (1954, 1970) has it, of western philosophy since its Hellenic and Hebraic beginnings.

It is this primary fragmentation, the alienation of self from other, and the corollary separation of different aspects of the human totality--the mind and brain, the appositional and propositional, the conscious and the unconscious--which forms the starting point of integrative thought. It explains the importance which it attaches to epistemology--to Henry Margenau's

(1950, 1972) concept of "constructs" for example. It explains also its interest in non-Western modes of knowledge--in, for example, F.S.C. Northrop's (1952) work on the relation between Western and non-Western knowledge systems. I do not personally feel that the positions of either Margenau or Northrop are entirely sound. Nor do I feel it to be entirely appropriate to restrict epistemological considerations to the realm of the physical sciences, which has so far been the main predisposition of integrative thought. But the way in which they look at this problem does indicate the importance which they attach to overcoming the constraints imposed by the dualistic mainstream of Western thought.

I was somewhat disappointed that the problem of historicity did not emerge in the session on philosophy. I cannot accept that philosophy is nothing more than what now passes for analytic philosophy. I would take the view that this approach is a valuable, necessary, but historically circumscribed phase, part of a wider--and much more important--tendency to disown the dualistic presuppositions of Cartesian thought. But there are many other strands in this development. In any case, even analytic philosophy, in its attempt to be humble, to eschew the grandiose schemes of traditional metaphysics, must ultimately rely on some set of assumptions, usually of the sceptical Humean variety. Thus in seeking to be nothing more than an under-labourer, it tends to treat these assumptions as somehow more reliable than those positions which it wants to analyse and clarify. The potential for hubris is therefore more likely to be realized than hopes for humility.

To restrict our conception of philosophy to its Anglo-American analytic variants of the last fifty years or so, necessarily blinds us to the nature of the changes which have occurred in this century. And without going into detail, I will bluntly assert that in just about every major area of modern thought--phenomenology, systems theory, structuralism, post-relativity and quantum physics, biological theory, hermeneutics and so on--we find a denial of the kind of absolute dualism, the separation of subject from object, which constitutes the paradigmatic character of Western thought. Instead we see an emphasis on complementarity, on transactionality, on mutual causality, on dialectic; on both/and, rather than either/or, on patterns of interaction rather than on objects with supposed relationships between them.

And it is precisely this kind of change which integrative education wishes to reflect. It is exactly this issue that the people who were instrumental in the early stages of the movement--the best known include Margenau, Northrop, Ludwig von Bertalanffy, Ervin Laszlo, Donald Hatch Andrews, Gardner Murphy, William Irwin Thompson, Pitirim Sorokin, Adolph Portman, Edmund Sinnott, Kirtley Mather, Lancelot L. Whyte, and Fritz Kunz--were deeply concerned in their respective fields (see Main Currents in Modern Thought).

The Cartesian era, then we might say, was essentially one of divide and rule. Separate man from nature to dominate it. Divide the world into its smallest components and "know" it. But the more bits there are, the fewer, proportionately, we can comprehend. The old adage that the right hand knows not what the left hand is doing is now far too simple. Instead of a knowledge explosion, we have an ignorance explosion. A world of specialists and hyperspecialists who, like perhaps the modern medical profession, can only cope with atomized problems rather than whole systems or people. Integrative thought does not deny the value of specialization, but rather seeks to balance it; to find some way of emphasizing relationships between different phenomena.

The way in which integrative education has been developed up to this point has been to focus on certain fundamental concepts which seem to be common to many different fields, and to trace the different manifestations of such concepts. Thus one can think of the concept of symmetry in crystallography, plant morphology, architecture, the visual arts and mathematics. Similarly concepts like time, space, causality, motion, boundaries, and equilibration, may be comprehended at many levels of the phenomenal world.

I do not at this point wish to justify the pedagogical value of these particular concepts. In some way they are rather obvious. In another way there are a number of difficulties in assuming that one can make meaningful correlations between, let us say, "space," in physical, biological, perceptual, behavioural, aesthetic, and social systems. I do not wish to pretend that these conceptual and philosophical problems are easy. They are not. I simply wish to emphasize very strongly that to talk of integrative education at all, is to focus concern onto relationships, onto patterns. And this is immediately to fly in the face of the ingrained philosophical assumptions which we have inherited from the Greeks, from Christianity, from the Renaissance, and the Enlightenment. Unless we take this into account, I fear that we will immediately fall victim of the trap exemplified by systems theory; a position which is inherently holistic and relational, becomes subsumed by the dominant dualistic theory of knowledge, and becomes an archetype of our modern technological rationality.

Difficult as these conceptual problems are, they do not exist in a social vacuum. I assume that I do not have to reiterate the extremely important issue raised in the session on the social sciences about the relationship between knowledge and social control (Young, 1971; Bernstein, 1971; Habermas, 1968, 1971). Likewise, I have not referred to Cartesian dualism as a philosophy of divide and rule, lightly. Let me refer for a moment to our notions of science. Broadly speaking, we find three major images. There is that offered by the great philosopher-physicists, who interpret their work within a processual, non-dualistic pattern orientation. There are the philosophers of science who fall back on the classic dualistic formulations of Kant and Hume. And there is the popular view of science, the view which is socially the most pervasive, which clings to Lockean notions of naive empiricism. The problem is that our general concepts of knowledge and education conform most closely to the latter. It is this kind of position which for example continues to see science as part of some supposed emancipation from myth, without recognizing the danger of succumbing to the objectivist illusion. It is these socially sanctioned concepts of knowledge which now dominate our lives. And thus the core question which must be asked is how can we begin to talk about holistic knowledge within a political, social, and cultural context of fragmentation? Is integrative education a conceptual or a political problem? My own rather banal response would be that it is both, an answer which merely multiplies the immensity of the problem. Is it something that is even compatible with existing educational institutions, or is it perhaps something less grandiose, something which may be approached without bothering about the wider scheme of things, something which may be approached more instrumentally by talking about more efficient ways of teaching at specific stages of a child's development. I personally feel that this attitude may be productive, but that unless the wider context is given primary consideration, the long term outlook is bleak. And although it may be true that in the long term we will all be dead, it is the long term that is important.

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